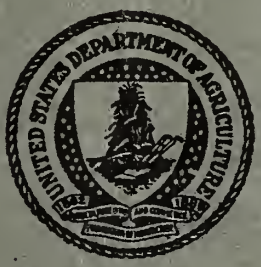
Agricultural Economics RESEARCH



CONTENTS FOR OCTOBER 1952 — *Vol. IV, No. 4*

		Page
Outlook Evaluation—Methods and Results	*John D. Baker, Jr. and Don Paarlberg*	105
A Test of Survey Methods for Estimating Stumpage Prices	*A. S. Todd, Jr. and John J. Zirkle, Jr.*	115
Effect of Personal Visits on Response Rates to Mail Surveys	*Cecil C. Smith*	126
An Experiment in Marketing	*Glenn L. Burrows*	128
Book Reviews	*Charles E. Kellogg, L. Jay Atkinson, Arthur G. Conover, Esther M. Colvin, Harold H. Ellis, Nathan M. Koffsky*	

UNITED STATES DEPARTMENT OF AGRICULTURE • Bureau of Agricultural Economics

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. • Price 20 cents

Contributors

Contributors are on the Staff of the Bureau of Agricultural Economics unless otherwise stated

JOHN D. BAKER, JR. earned his doctorate at Purdue this year and is now engaged in price research with the firm of Longstreet Abbott in St. Louis.

DON PAARLBERG is Professor of Agricultural Economics at Purdue University, specializing in prices and statistics.

A. S. TODD, JR. is a forest economist in the Southeastern Forest Experiment Station of the U. S. Forest Service at Asheville, N. C. He was formerly in charge of computation and analysis of forest volume and growth data for the National Forest Survey in the same station.

JOHN J. ZIRKLE, JR., an economist, formerly with the Southeastern Forest Experiment Station of the U. S. Forest Service at Asheville, N. C., is now in the Industry Division of the Forest Products Section of the Bureau of the Budget.

CECIL C. SMITH has been with the Agricultural Estimates branch of BAE since 1942. His article is a report of a study made in the office of the State Statistician at Boise, Idaho.

GLENN L. BURROWS is a member of the BAE statistical consulting unit. His paper, like the one he published in the April issue, is a byproduct of his work, which is directed toward the improvement of statistical techniques in marketing research.

CHARLES E. KELLOGG, world authority in the field of soil classification and geography, has studied soil problems and made recommendations to governments for soil research and land development in England, France, Italy, Greece, Yugoslavia, Austria, Czechoslovakia, Germany, Russia, Siberia, North Africa, the Belgian Congo, Egypt, Iran, Canada, Mexico, Australia, and New Zealand. The author of numerous bulletins and papers on the origin, classification, and conservation of soil, Dr. Kellogg's recent contribution to the UNESCO-FAO Food and People Series, *Food, Soil, and People,* attracted world-wide attention. He is Chief of the Soil Survey Division in the Agricultural Research Administration, U. S. Department of Agriculture. His most recent book, *Our Garden Soils,* was published by Macmillan last April.

L. JAY ATKINSON, formerly in the Division of Farm Management and Costs, BAE, is an economist in the Office of Business Economics of the Department of Commerce. He has worked both in agricultural economics and in the industrial and general economics field.

ARTHUR G. CONOVER is head of the Tobacco Section in the Division of Statistical and Historical Research. He writes the periodical issues of *The Tobacco Situation.*

ESTHER M. COLVIN, an editor on the staff of the Division of Economic Information, is a frequent contributor to the *Agricultural Situation* and other publications of the Bureau of Agricultural Economics.

HAROLD H. ELLIS, agricultural economist and lawyer, is a member of the staff of the Division of Land Economics. He is chairman of the Subcommittee on Legal Aspects of Land Tenure for the Southeast Land Tenure Research Committee.

NATHAN M. KOFFSKY, a frequent contributor to *Agricultural Economics Research,* is Associate Head of the Division of Statistical and Historical Research. For several years much of his time has been devoted to analysis of economic conditions affecting demand for farm products.

EDITORS: CHARLES E. ROGERS
HERMAN M. SOUTHWORTH

AGRICULTURAL ECONOMICS RESEARCH

A Journal of Economic and Statistical Research in the
Bureau of Agricultural Economics and Cooperating Agencies

Volume IV OCTOBER 1952 Number 4

Outlook Evaluation – Methods and Results

By John D. Baker, Jr., and Don Paarlberg

Most of the papers published in Agricultural Economics Research *originate either within the Bureau of Agricultural Economics itself or in projects carried on cooperatively with the State Agricultural Colleges. This is not an inviolable rule, however, and this issue contains two exceptions to it: the present article and another, farther on, by Messrs. Todd and Zirkle of the Forest Service. In both cases, of course, the subject matter appears to be of especial interest to workers within the Bureau.*

This article summarizes a study which was planned and carried forward by Messrs. Baker and Paarlberg as a part of Baker's graduate work at Purdue. Several of us in the Bureau were acquainted with the fact that the study was under way and we not only supplied Mr. Baker with some of his Agricultural Situation references which were used as the source of the forecasts but also had some opportunity to discuss concepts and methods. The subject matter is of such a direct and immediate interest to all those interested in agricultural outlook work that we believed it warranted an invitation to Messrs. Baker and Paarlberg to prepare this article. As was indicated in the foreword to James P. Cavin's "Forecasting the Demand for Agricultural Products" in the July issue, we need more appraisal and criticism of our forecasting results rather than less; and this is in effect a companion to Cavin's analysis, as this article evaluates the accuracy of our forecasting results while Mr. Cavin's article dealt chiefly with methods by which the forecasts are derived.

O. V. Wells

ECONOMIC FORECASTING is an integral and indispensable part of the entrepreneurial function. Such forecasting is difficult because of the large number of factors and the complexity of relationships that influence the economic system. Many of these factors and relationships are not adapted to precise or easy prediction and most of them are in process of continual change. To aid individuals in this difficult work the Government has been in the forecasting field for the last 30 years, publishing discussions of the economic situation and making forecasts in various economic areas.

The purpose of the study that is reported in this article was to evaluate the accuracy shown by the Federal Government in making some of the economic forecasts that relate to agriculture. No attempt was made to measure complete adequacy, which would include measures for timeliness, definiteness of statement, and the importance of the event forecasted.

Criteria Used

Accuracy was measured by an evaluation score which ranged from 0 to 100, with 50 representing the score that would theoretically be

obtained if random forecasts were made over a long period of time. Each prediction and each corresponding outcome was classified as a decrease, stability, or increase, and values were assigned rating the forecast (table 1). When the prediction and the outcome were in agreement the forecast received a score of 100. Forecasts of decreases and increases for which the actual outcome was stability received a score of 50. If economic conditions went opposite to a directional prediction the score was zero. A forecast of stability followed by a movement in either direction received a score of 25. The average of these scores was taken as the measure of accuracy for the series or part of the series being examined.

TABLE 1.—*Values assigned to various forecasts according to the actual changes that occurred*

Forecast	Actual change		
	Decrease	Stability	Increase
	Points	*Points*	*Points*
Decrease	100	50	0
Stability	25	100	25
Increase	0	50	100

Limits for ascertaining decreases, stabilities, and increases were calculated for each separate time pattern (monthly, quarterly, or annual data) of each series by arraying the percentage changes from the greatest minus to the largest plus change during the time under consideration. A third of the observations around the point of zero change was the area of stability. Changes greater than the limits of this area were either increases or decreases, depending upon the direction. To make them as comparable as possible, actual changes used to check each forecast were calculated as changes per unit of time. For example, limits for averages a few months in length were calculated on the basis of changes from one month to the next. A change covering 6 months from the time of forecast might have a large absolute error but change per month (the basis for the calculation of breaking points between increases, stabilities, and decreases) would be much smaller. The change was therefore reduced to a per month basis to be fairly evaluated.

In addition to the basic accuracy evaluation score already described, an error reduction score was used as a measure of forecast accuracy for acreage, production, and carry-over in wheat, and could be used for any other predictions involving numerical data. The error reduction score is the percentage by which the forecast error is less than the average error made through a guess based on the outcome for the previous year. An example of the use of the error reduction score is that of its application to annual forecasts of wheat acreage. Here forecasts were 26 percent better than guesses. This and other scores were derived as follows:

The average annual variability or variation in wheat acreage from one year to the next was 6.6 percent from 1938 to 1949.	(If nothing were known about the prospective changes in wheat acreage, and a guess based on last year's production were made, the error would average 6.6 percent.)
The average percentage error in forecasts from 1938 to 1949 was 4.9 percent.	(The error was reduced from 6.6 percent to 4.9 percent when predictions were made based on various influencing factors.)

This constitutes a reduction in error of 26 percent:

$$\frac{6.6 - 4.9}{6.6} = .26\ (100) = 26$$

If the forecasts had been perfect the score would have been 100:

$$\frac{6.6 - 0.0}{6.6} = 1.0\ (100) = 100$$

If the forecasts had been no better than a guess based on last year's outcome the score would have been zero:

$$\frac{6.6 - 6.6}{6.6} = 0.0\ (100) = 0$$

If the forecasts had been worse than a guess based on last year's outcome the score would have been negative:

$$\frac{6.6 - 7.6}{6.6} = \frac{-1.0}{6.6}\ (100) = -15$$

A third check on the forecasting success of some entirely numerical forecasts was the average of the percentage errors. Algebraic totals and averages were calculated to show the direction of error. A total error and an average in which the signs of the errors were disregarded were computed to show the average percentage errors, not considering direction.

It is important to recognize the difference between accuracy as it is used in the evaluation score of this study and accuracy in an

absolute sense such as when an actual error is calculated. Using absolute errors as a criterion would be saying that forecasters consider all series the same, regardless of variability, and that a change of 5 percent in a series that changes little over time is of the same importance as a 5-percent change in a series having great variation. Forecasters recognize the nature of the data with which they work, and forecast accordingly. Therefore it is an error to think of accuracy in an absolute sense if series are to be compared with one another.

Evaluation of Forecasts of General Economic Series

Forecasts of the general economic situation are useful, not only for planning by entrepreneurs, but, as results of this study showed, for obtaining more accurate forecasts for smaller economic areas and for individual commodities.

The total score for all series together was 75. This was obtained from a total of 631 forecasts that were checked in four series. Three of the four series, Industrial Production, Demand, and Farm Income, were forecast with about the same degree of accuracy, having scores of 77 and 78, while the series of Prices Received by Farmers fell much lower, with a score of 60. To refresh memories, these scores are to be compared with 100 as perfect, zero as totally wrong, and 50 expected from pure guessing.

Forecasts of the directional movement of an average for a year were more accurate than those for averages covering shorter periods. (This was not true for the absolute errors.) This held for forecasts of wheat price as well as for those of the more general economic forecasts.

Forecasts for a short time into the future, with a score of 78, were more accurate than long-term predictions scores of 72. The difference in favor of short term came in forecasts of an average for a year and of a period in the future which was to be compared with a corresponding period in the previous year, and in the series which represented agriculture. It was absent in forecasts of an average for a few months in nonagricultural series.

Accuracy of forecasting appeared to be lower when conditions were relatively more variable and uncertain. For example, Industrial Production forecasts had a score of 46 in 1929-36 and 69 in 1946-50, as compared with an average for the entire period of 77.

Except for forecasts of specific figures that were mostly forecasts of annual averages, definitely stated forecasts were only slightly more accurate than forecasts that were vaguely stated.

Forecasting major economic changes was considered a necessary part of forecasting work, as these changes often have a profound effect on the success of some business ventures. Accuracy in predicting major turns (including forecasts referring to major changes that did not occur) can be characterized as low. Industrial Production, Demand, and Prices Received by Farmers had scores of 48 and 50. Forecasts of major downturns were least accurate, while forecasts of stable periods had the highest score. Accuracy of upturn forecasts was considerably better than that of downturns.

Accuracy of Federal forecasting has not developed to a point at which a consistent job of forecasting can be accomplished year after year. Large variations in accuracy from one year to another continued to the end of the study.

Evaluation of Forecasts Pertaining to Wheat

Production, carry-over, and price forecasts of wheat tapped a difficult forecasting area. The 558 forecasts relating to wheat production, carry-over, and price evaluated in this study obtained an accuracy evaluation score of 76. The 195 forecasts of price, 300 of production, and 63 of carry-over provided a sufficient number in each major group to give fair reliability to most of the classifications made in analysis. An accuracy of close to 80 was found for the carry-over and production forecasts, and of 69 for price forecasts. When forecasts of approximately equal length in each area were compared, carry-over predictions were still far out in front, with a score of 92, while production forecasts fell to 69, the same as the score for all price forecasts.

Spring wheat production and carry-over were the more variable series (as measured by

the co-efficients of variability) yet this did not prevent these series from having the highest score for accuracy. The evaluation score was a relative one. On an absolute basis, the errors in predicting spring wheat production and carryover were large.

Wheat Price Forecasts

Price forecasts for wheat were given a major position in the study. Price is usually considered to be the final result of the interacting forces of supply and demand. It is here that the influences of changes in production, demand, and the opinions of businessmen are registered. It is price, in combination with production, that determines the total income of the wheat farmer.

Price forecasts for wheat fell naturally into three groups: (1) First were forecasts of world wheat prices, which were taken to refer to the price at Liverpool. The Liverpool market was closed late in 1939 because of the war, and the few forecasts of world prices made since that time were not evaluated. (2) The second group consisted of 129 forecasts of average prices in the United States. Two series made up this group. First were forecasts of the average price of all classes and grades of wheat in the 6 major markets, and second, the average price received by farmers. (3) In the third group were 31 forecasts of a specific grade and class of wheat either for a certain market or as a United States average price.

World wheat price forecasts, with a score of 75, were the most accurate of the three groups. This was 7 and 8 percentage points better than the score for the other two groups. United States average prices had a score of 67 and specified classes and grades had a score of 68.

As in the case of the general economic forecasts, the predictions of directional movement of annual average prices were more accurate than were monthly predictions. Annual averages had a score of 72, monthly forecasts a score of 66. More forecasts of annual average prices which were generally successful were made than was the case with other major groups of series. It was to this fact that the better record for accuracy of world price predictions was in part attributed.

Relative forecasts, which were predictions of conditions in one series relative to conditions in another series or time period, were found to be more accurate than other price forecasts. Relative forecasts scored 76.

Although the number of forecasts has fluctuated from year to year, there seems to be a general upward trend in the rate of forecasting. This is amply demonstrated if the period of 1927-29—a period in which an abnormal number of wheat price forecasts were made—is eliminated. In 1922-26 the number of forecasts averaged 1.2 forecasts a year; in 1930-40, 4.6; and in 1941-50, 7.5.

Consideration of wheat price forecasting brings to light two noteworthy facts. First, with the exception of 1948-49, both forecasting accuracy and skill decreased in recession periods (table 2, fig. 1). The poorer forecasting accuracy in depressions is emphasized even more when scores in more precisely defined depression periods are compared with those of other periods.

Second, average scores for long-time periods showed a consistent increase in the accuracy of wheat price forecasting, although individual series deviated from this pattern. In 1922-32 the score was 63; in 1933-40 it was 68; and in 1941-51 it was 71. Improvement in the forecasting of annual averages was more marked and consistent than in the forecasting of monthly changes.

Long-term forecasts were found to be slightly more accurate and to have a higher skill

TABLE 2.—*Wheat: Price forecasts per year and accuracy evaluation score, specified periods, 1922–51*

Period	Description of period	Forecasts per year	Accuracy evaluation score
		Number	*Points*
1922–28	Pre-depression	5	74
1929–32	Depression	[1]11	54
1933–36	Post depression	5	71
1937–40	Prewar (includes 1938 recession)	5	60
1941–45	War	4	77
1946–51	Postwar (includes 1948 recession)	10	74

[1] Most of these forecasts were made in 1927–29.

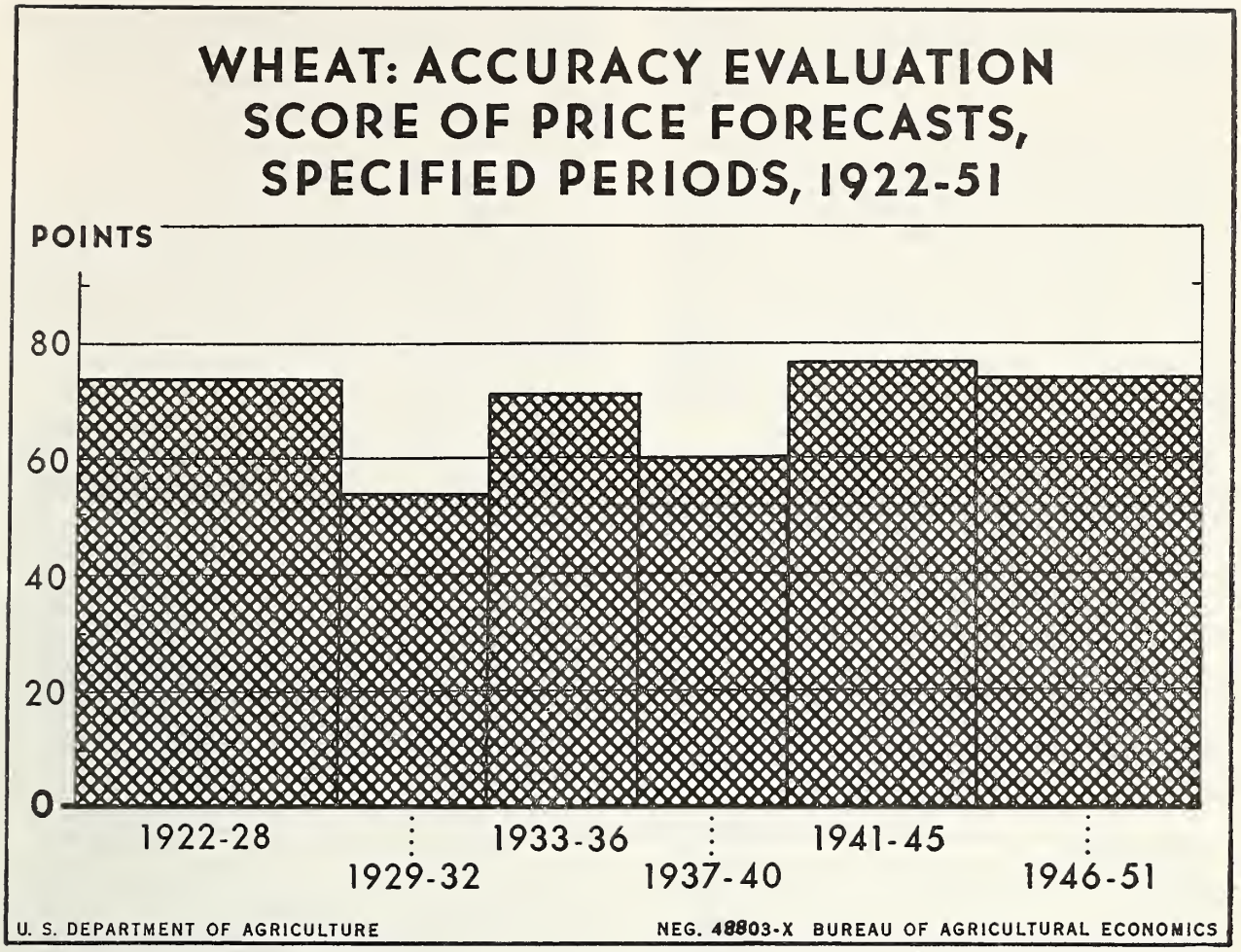


Figure 1

score [1] than short-term forecasts. With but few exceptions, this held true for the major groups of series and minor subdivisions. The difference really existed in the annual averages, which have a score of 78 for long-term and 65 for short-term, while monthly forecasts showed about the same accuracy for the two lengths. This is different from the situation that existed for the more general forecasts.

Consideration of the number of forecasts made in the various directions showed traces of overoptimism. In some of the series the proportion of increases forecasted was larger than the proportion of the number of months the trend was upward. In accuracy, the predictions of increases were lowest, with a score of 62. Stabilities had a score of 71, decreases 76.

Wheat Production Forecasts

Predictions of wheat acreage to be seeded were the earliest forecasts that might be of value to farmers in planning production. They were usually made in August or September for the crop to be harvested the following year. The series that was studied covered the years

[1] Skill score is a measure of the improvement in accuracy over the accuracy attainable by methods available to any untrained forecaster. In this study it was assumed that any untrained forecaster could project a trend. These trend projections frequently gave fairly high scores. Skill was said to be shown only when the score attained exceeded the trend-projected score. From 1941 to 1945 the skill score in forecasting the wheat price was 17, calculated thus:

Evaluation score	77
Trend-projected score	60
Skill score (77-60)	17

1938-51, with the exception of 1944, for which no forecast was found. This series had an evaluation score of 75 with a better record in the first part of the series, 1938-43 (score 92), than in the last part, 1945-51 (score 61).

The average of percentage errors, disregarding signs, made in forecasting each year is a measure of the magnitude of the error made. This average total percentage error, signs disregarded, for the entire period studied was 4.9 percent, or an average of 3.5 million acres a year. The average percentage error was slightly larger in 1945-51 than in 1938-44, being 5.2 percent as compared with 4.6 percent.

As was true with other production series, forecasts of wheat acreage to be seeded tended to be too low. For the entire period the algebraic average error was —2.9 percent. Most mistakes in direction were made in 1945-51, when the error was —5.2 percent while 1938-43 had an error of only —.1 percent.

Winter Wheat Production Forecasts

Winter wheat makes up about three-fourths of total wheat production in the United States and is, therefore, a large part of the wheat-supply picture. Forecasts of production were usually made in December, April, May, June, July, and August.

The evaluation score for all winter wheat production forecasts was 78. Accuracy varied between 70 and 75 for forecasts made from December until June. After June a definite im-

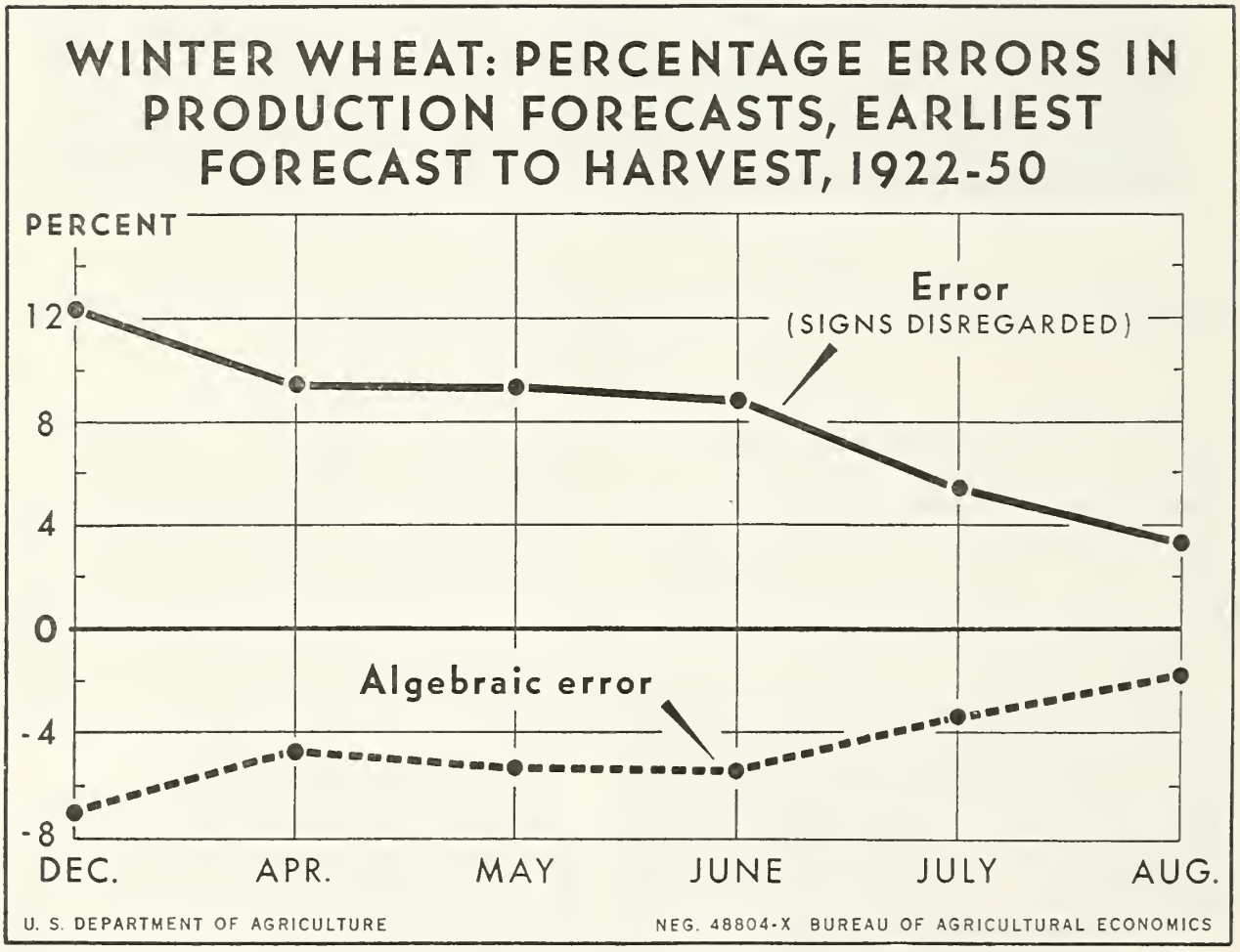


Figure 2

provement was noted (table 3). In fact, accuracy went from 71 in June to 89 in July.

Calculation of the average algebraic error shows that the production forecast for all winter wheat averaged 4.8 percent low but improved somewhat irregularly from —9.5 in December to —1.8 percent in August. The total percentage error, disregarding signs, averaged 8.3 percent for all forecasts during the period. From December through August there was a steady decrease in the average percentage error (fig. 2).

Three time periods, 1922-30, 1931-40, and 1941-50, were used for comparison. By all criteria 1931-40 was the poorest forecasting period (table 4).

Failure of accuracy to increase does not necessarily mean that forecasting methods were poorer in the later years. It could well be that forecasting was more difficult during the last two periods. Droughts in the 1930's and extremely good seasons in the early 1940's could easily have made forecasting less accurate.

Accuracy of Spring Wheat Forecasts

Forecasts of spring wheat production were usually made in December, March, June, July, August, and September. The accuracy evaluation score for spring wheat was slightly higher than that for winter wheat, but the absolute errors were considerably greater. The accuracy evaluation score on the average improved from December through September but the average total percentage error, signs disregarded, did not improve materially until after June (table 5, fig. 3). The algebraic error of —1.3 for forecasts of spring wheat was smaller than that for winter wheat.

Of the three time periods used, 1931-40 was the period of most accurate forecasts as measured by all criteria except algebraic errors. The 1922-30 period had a score of 90, 1931-40 had a score of 92, and 1941-50 had a score of 66 (table 6).

It might be supposed that production forecasts are taken into consideration when making price forecasts. If this were the case, accuracy of price predictions would depend to a certain extent upon accuracy of production forecasts. Analysis made from data used in this study reveals no such positive relationship. Success in price forecasting was poorest

TABLE 4.—*Wheat, winter: Evaluation score and errors in production forecasts, specified periods, 1922–50*

Period	Accuracy evaluation score	Percentage error		Error reduction score
		Total	Algebraic	
	Points	*Percent*	*Percent*	*Points*
1922–30	83	6.5	—2.3	55
1931–40	74	10.4	—8.3	40
1941–50	79	7.9	—3.4	53
1922–50	78	7.8	—4.8	51

TABLE 3.—*Wheat, winter: Evaluation score and errors in production forecasts, specified months, 1922–50*

Month	Accuracy evaluation score	Percentage error		Error reduction score
		Total	Algebraic	
	Points	*Percent*	*Percent*	*Points*
December	71	12.3	—7.0	14
April	75	9.4	—4.7	43
May	75	9.3	—5.4	42
June	71	8.9	—5.5	45
July	89	5.4	—3.5	66
August	87	3.4	—1.8	78
Average	78	8.3	—4.8	51

TABLE 5.—*Wheat, spring: Evaluation score and errors in production forecasts, specified months, 1922–50*

Month	Accuracy evaluation score	Percentage error		Error reduction score
		Total	Algebraic	
	Points	*Percent*	*Percent*	*Points*
December	59	19.1	—11.4	—17.0
March	62	21.0	— 7.9	— 9.6
June	74	18.2	+ 2.5	28.0
July	85	13.2	+ 1.3	54.0
August	87	6.8	+ 0.4	77.0
September	95	5.3	— 0.4	82.0
Average	80	12.5	— 1.3	52.0

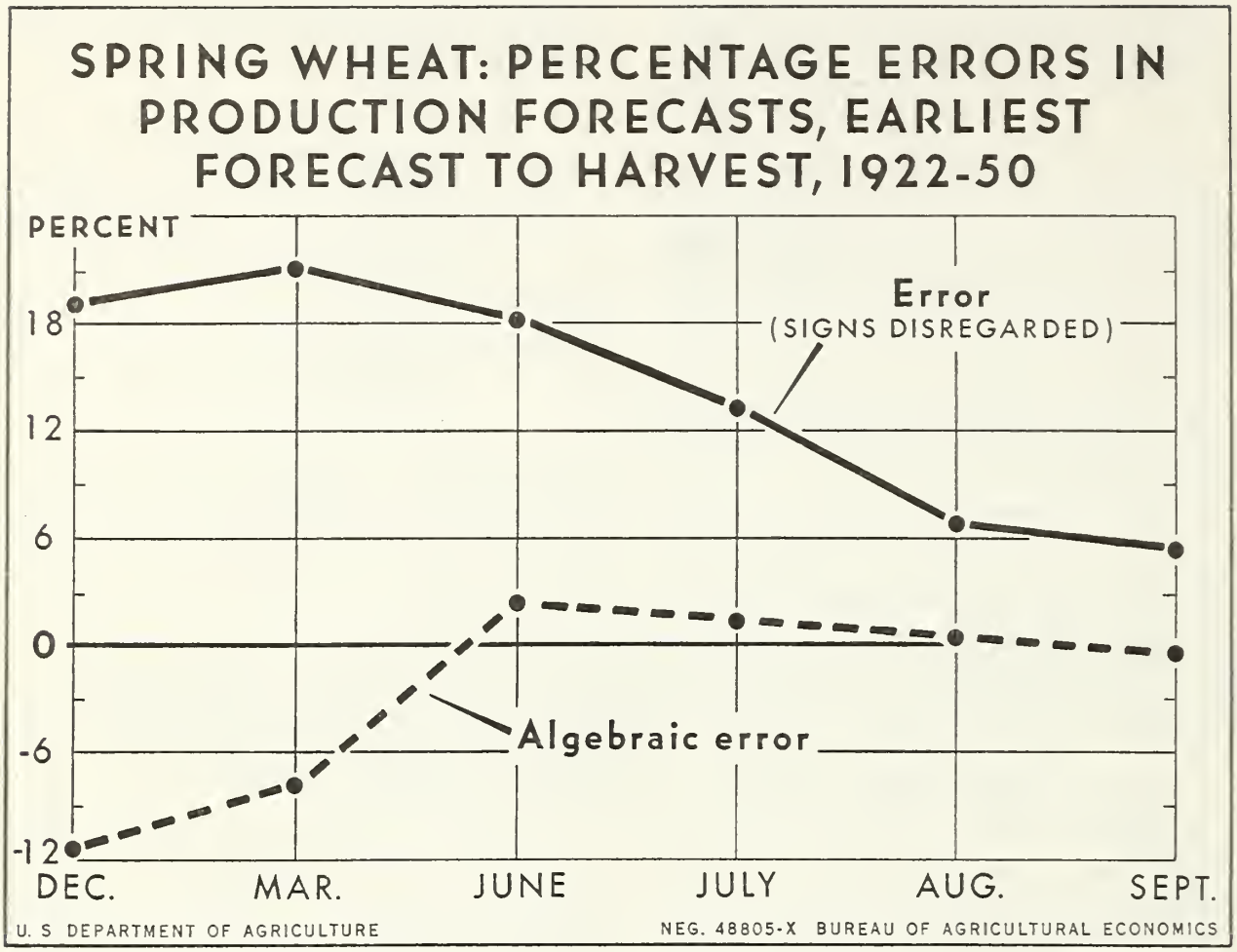


Figure 3

when production forecasting was best. Apparently other factors had more effect in determining the accuracy of wheat price forecasting and outweighed whatever advantage accurate production forecasting might have had.

Price forecasting was best when the general economic situation was accurately predicted. In years when demand was forecasted accurately, the wheat price score was 93; during years when demand forecasts were poor, the wheat price score was only 71.

TABLE 6.—*Wheat, spring: Evaluation score and errors in production forecasts, specified periods, 1922–50*

Period	Accuracy evaluation score	Percentage error		Error reduction score
		Total	Algebraic	
	Points	*Percent*	*Percent*	*Points*
1922–30	90	9.4	— 3.9	59
1931–40	92	13.9	+10.2	72
1941–50	66	13.3	— 8.7	—30
1922–50	80	12.5	— 1.3	52

Carry-Over Forecasts

Forecasts of wheat carry-over on July 1 of each year were segregated into groups according to the length of time before the carry-over date that the forecasts were made. The groups were: 2-year forecasts (those 23 or more months before the carry-over date), more than 1 year (12 to 22 months before), 1 year (10 to 12 months before), 6 months (January and

February previous), and 3 months (April before the carry-over date). Carry-over forecasts had an evaluation score of 82, with little difference between the time periods of 1937-44 and 1945-51. For all forecasts covering the entire period there was steady improvement in accuracy from the 2-year forecasts to those made 3 months before the carry-over date (table 7).

However, during 1945-50 rather radical changes took place in exports of wheat owing to needs in war-devastated countries, and for this reason carry-over supplies changed to a much greater extent than had been expected.

TABLE 7.—*Wheat: Evaluation score in carry-over forecasts, by length of forecast, specified periods, 1937–51*

Length of forecast	Evaluation score		
	1937–44	1945–51	1937–51
	Points	*Points*	*Points*
Two years	25	67	56
Over one year	65	79	73
One year	82	71	77
Six months	100	82	92
Three months	100	100	100
Average	85	80	82

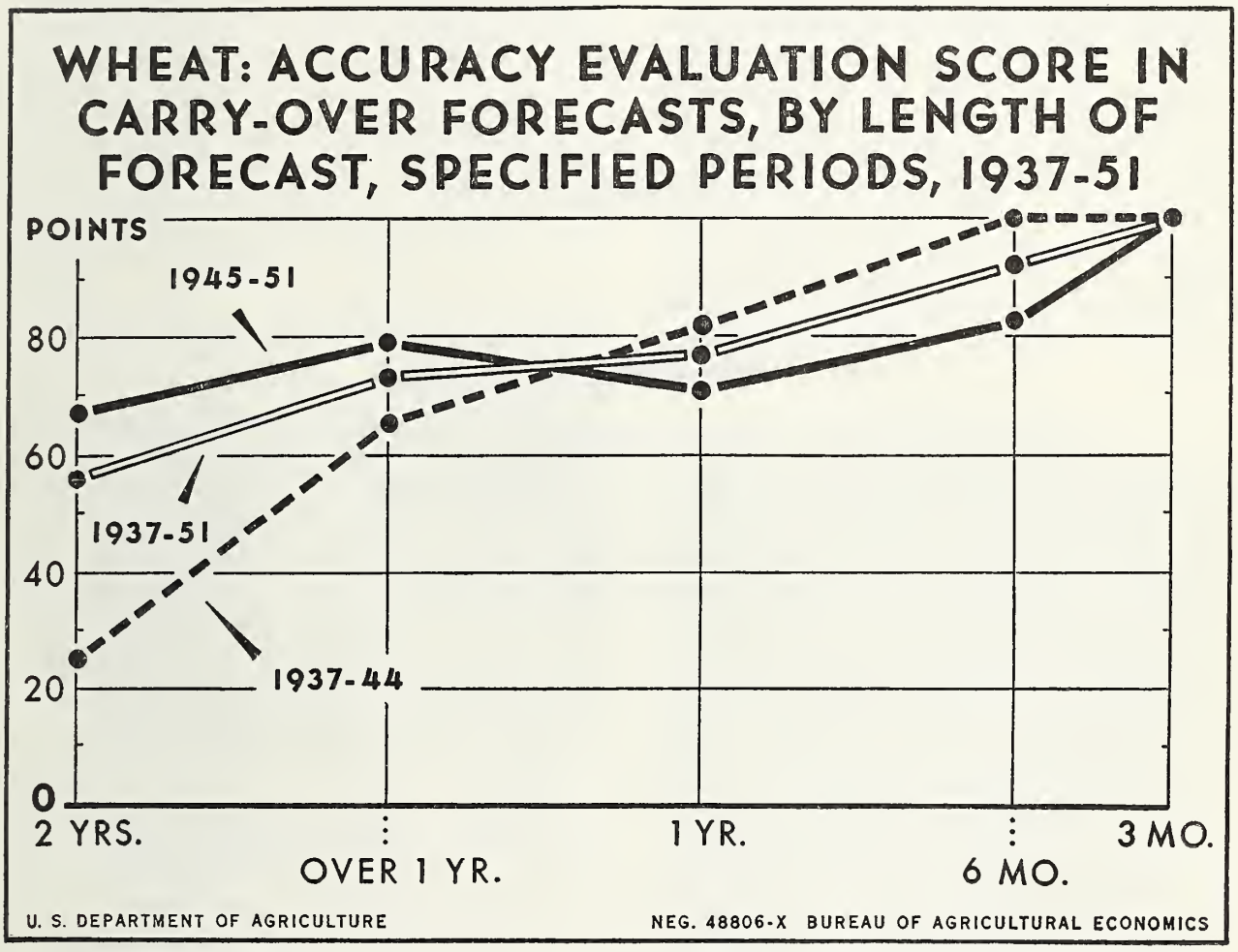


Figure 4

Carry-over became low, so percentage changes and percentage errors were large.

Summary

In the last 30 years many extremes have occurred in our economic structure and activity. There have been eras of great prosperity, severe depression, recovery, war, and postwar readjustment, along with an economy growing in complexity and in technological advance. When these factors are added to the political changes and the numerous shifts in Government bureau administration and personnel that have taken place, the accuracy evaluation score of 75 for the major forecasting areas and 76 for all wheat forecasts appears commendable. An accuracy level of this magnitude is a favorable fact in and of itself.

Certain weaknesses and areas of poor record should not be ignored, even though the forecasting in some of these situations might be termed more difficult than in others. Perhaps the greatest indication of weakness is the considerable variability in accuracy from year to year and from one classification to another. It is because of this variation that averages for longer periods and larger groupings are reported and used for drawing conclusions. Certainly consistency in forecasting, as well as high accuracy and high skill, is important. The recent record shows that this is lacking. Another obviously weak area was that of Prices Received by Farmers, which had an accuracy evaluation score of 60 for all forecasts made.

Despite the weaknesses, the score attained and areas of strength give hopeful indications. With better data, better forecasting techniques, and a better appraisal of the record, improvement in accuracy and skill may be shown.

The Farm Economic Association Awards

Agricultural Economics Research takes pleasure in congratulating the recently announced winners of the American Farm Economic Association awards. Awards for meritorious published research went to Marguerite Burk for "Changes in the Demand for Food from 1941 to 1950," *Journal of Farm Economics,* August 1951; to Karl Fox for "Factors Affecting Farm Income, Farm Prices, and Food Consumption," *Agricultural Economics Research,* July 1951; and to Orlin J. Scoville for "Relationship Between Size of Farm and Utilization of Machinery, Equipment and Labor on Nebraska Corn-Livestock Farms," U. S. Dept. Agr. Tech. Bul. 1037, Sept. 1951. An award for the year's best paper in the *Journal of Farm Economics* went to Frederick V. Waugh for "The Minimum-Cost Dairy Feed (An Application of 'Linear Programming')" which appeared in the August 1951 issue. All of these winners have been contributors to *Agricultural Economics Research.*

Awards for outstanding doctoral dissertations went to Quentin M. West, Cornell University, "Some Alternative Sampling Techniques in the Measurement of Farm-Business Characteristics;" Procter Thompson, University of Chicago, "Productivity of the Human Agent in Agriculture: International Comparison;" and Mahmoud Ahmed El-Shafie, University of Wisconsin, "Population Pressure on Land and the Problem of Capital Accumulation in Egypt."

A Test of Survey Methods for Estimating Stumpage Prices

By A. S. Todd, Jr. and John J. Zirkle, Jr.

The Forest Service needed information as to prices of standing timber and logs for use in a study of distribution costs and margins in the pine lumber industry of the Southeast. The study was conducted under the Agricultural Marketing Act of 1946 (RMA, Title II). As North Carolina, the chosen site for the study, has 4,600 sawmills and hundreds of thousands of wooded properties, some method of sampling had to be devised. Whom to sample, what kind and how large a sample to take, and how to assure a representative sample were some of the questions that arose. For this reason, and because it seemed an excellent opportunity for a test of price-survey techniques, the study that is reported in the following paper was designed to permit comparisons of several more or less obvious methods of obtaining price data.

Collection of Data

DATA ON PRICES of stumpage and logs in the Southeast are available from three sources—buyers, sellers, and informed outsiders such as local foresters who assist sellers. If a quick, rough estimate were sufficient, one could canvass the foresters and average the reported prices. But each reported price would, in itself, be the estimated mean of an unknown number of transactions and an unknown volume of material. In many cases even the specific area to which the price applied could not be ascertained.

Enumerating or sampling sellers would avoid this difficulty, but either method would impose the time-consuming task of finding the individuals. Not all farms or other land holdings include timber, for instance, and probably fewer than 1 in every 250 timbered tracts are sold in a single month. Another objection to sellers as a source of price data is the rather high proportion who sell stumpage "by the boundary" for a lump sum and have little or no idea of the quantity actually sold.

Buyers, on the other hand, are fewer than sellers. They ordinarily make several purchases during the course of a year, and are able to measure or estimate quantities with some degree of accuracy. In short, they are easier to find and can frequently report specific purchases as of several dates. For these reasons, buyers provided all the price data for this study.

Two adjacent areas in North Carolina, 1 of 12 counties in the Piedmont and 1 of 17 counties in the Coastal Plain, were selected for study (fig. 1). A complete mailing list of sawmills and concentration yards for each area was compiled in 1947.

A questionnaire was designed primarily for mail use. As only one species group, the yellow pines, was involved, it was possible to reduce the form to a few simple questions on one side of a letter-size sheet. The following information was requested: (1) Prices paid for pine stumpage and logs as of May 1, 1950; (2) the basis of payment, that is, lumber tally, either actual or estimated, versus one of the log rules; (3) board-foot volumes of stumpage and log purchases during the first 4 months of 1950; and (4) number of timber tracts purchased during the same period.

The Mail Survey

The first mailing of questionnaires went out about May 15, 1950, to all the sawmills and concentration yards on the 1947 list. It was followed at 10-day intervals by two more mailings to those who did not respond. In each case, the questionnaire was accompanied by a form letter explaining why the information was needed and promising confidential treatment of replies. For the second mailing, the letter was stamped "Second Request", for the third, "An Immediate Reply Is Requested". One paragraph read as follows:

"Unfortunately, our mailing list is several years old. If you are no longer in the lumber business, if you are not operating your sawmill (or sawmills) at present, or if you do only custom or contract sawing, please note this on the form and return it to us anyway".

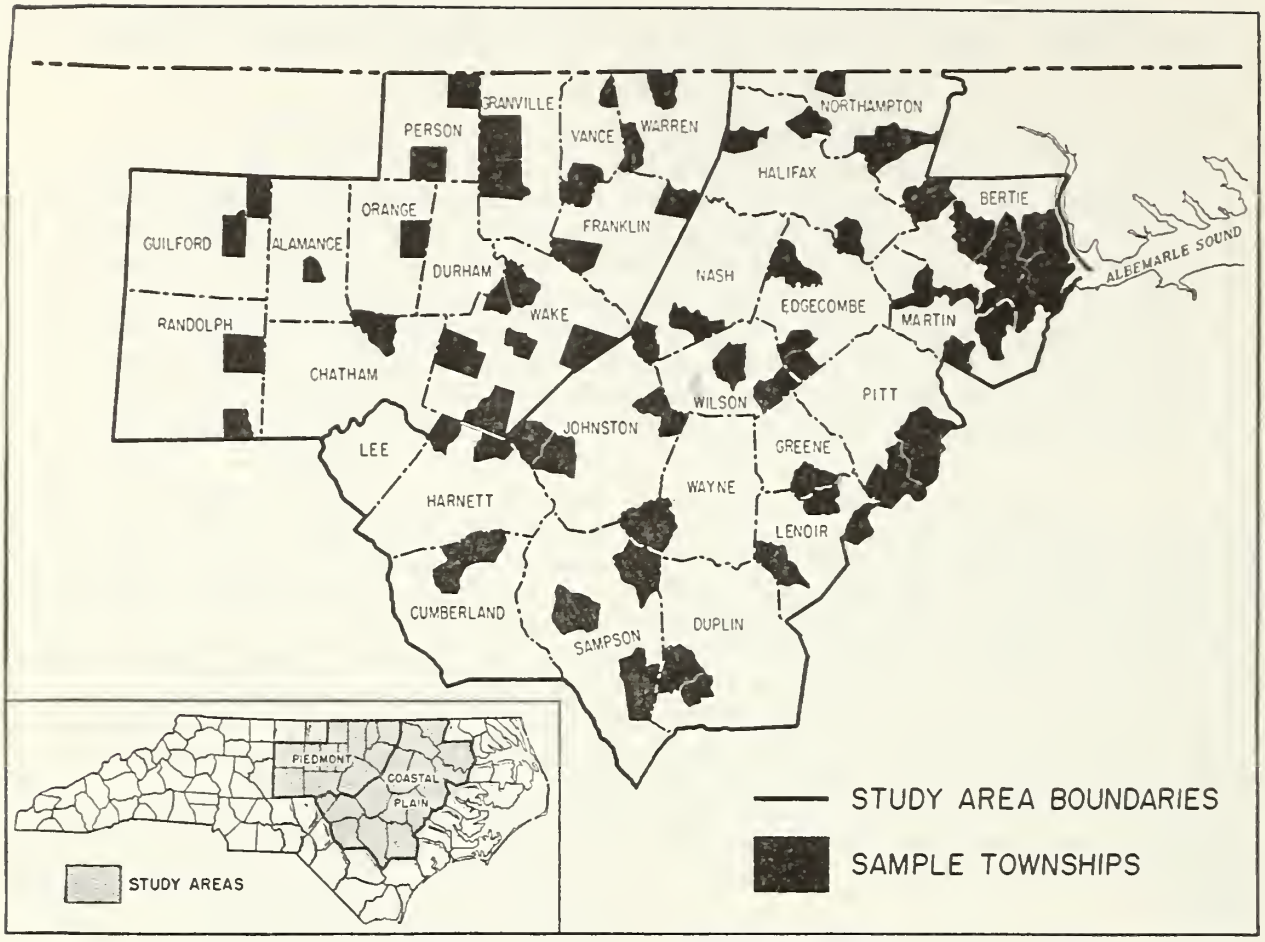


Figure 1

This plea brought replies from many operators who were not in the market for stumpage or logs and would not have responded otherwise. A tally of returns indicates that not more than 30 percent of the names on the 3-year-old lists were even potential sources of price information. This indicates that mail canvasses of this type may achieve a higher percentage response than they appear to attain. Table 1 summarizes the results of the three mailings.

During the course of the three mailings, 3,411 questionnaires were mailed—1,664 in the Piedmont and 1,747 on the Coast—to the 1,441 listed operators in the two study areas. Of 1,357 addressees who apparently received their questionnaires, 659, or practically 50 percent, responded. Thirty-two percent of the returns were in response to the first mailing, 48 percent to the second, and 20 percent to the third. Only 192 of the 659 respondents reported prices. The price reports numbered 105 with stumpage price only, 82 with both stumpage and log prices, and 5 with log price only. Of the others, 144 operated private, custom, or contract sawmills that bought no stumpage or logs, while the remaining 323 were variously reported as deceased, out of business, idle, or buying only hardwoods.

The Field Sample of Nonrespondents

Tests of mail canvasses have shown that the individual's readiness to respond is usually proportional to his interest in the subject matter of the questionnaire. For example, if production of some commodity were the item called for, high producers would be more likely to respond than low producers. Thus, mail responses may not properly represent the entire

population for which information is sought.

In the case of stumpage and log prices, it was not apparent whether this principle would apply. Data were needed to test the mail sample for bias from this source and provide a correction should this be necessary. Accordingly, a random sample of 100 operators in each area was drawn from those who had not responded to any of the mailings. These individuals were interviewed by field men.

The interviews yielded 99 reports in the Piedmont and 98 in the Coastal Plain. The other three names turned out to be duplicates. The 99 reports from the Piedmont included 35 with stumpage price only, 2 with both stumpage and log prices, and 2 with log price only; the 98 Coastal Plain reports included 25 with stumpage price only, 12 with both stumpage and log prices, and 1 with log price only.

TABLE 2.—*Number of nonrespondents sampled and stumpage and log price reports received, by study area*

Area	Sampled	Reports received with			
		Stumpage price [1]		Log price [1]	
		Actual	Percentage	Actual	Percentage
	Number	*Number*	*Percent*	*Number*	*Percent*
Piedmont	99	37	37	4	4
Coastal Plain	98	37	38	13	13

[1] Includes returns with both stumpage and log prices given.

The Area Samples

If an up-to-date mailing list had been available, the sampling of nonrespondents might have been adequate protection against the possibility of an unrepresentative sample. But our list was 3 years old and since its compilation a few operators had died, others had moved, and some had sold out. As sawmill machinery is long-lived and the pine-lumber market was booming, it seemed probable that many of the missing mills were still operating, perhaps under new owners. In addition, new operators with new equipment had undoubtedly entered business each year. Failure to sample them might have meant the omission of the youngest and most enterprising lumbermen.

Lacking any knowledge of the names or whereabouts of the new operators, the only

TABLE 1.—*Number of addressees, questionnaires returned, and number returned with stumpage and log prices, by mailing and study area*

Mailing	Addressees	Questionnaires returned					
		Total		With stumpage price [1]		With log price [1]	
		Actual	Percentage	Actual	Percentage	Actual	Percentage
	Number	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Piedmont							
First	715	[2] 96	13	23	3	6	1
Second	554	159	29	50	9	12	2
Third	395	47	12	9	2	2	1
Total	715	[2] 302	42	82	11	20	3
Coastal Plain							
First	726	[3] 117	16	34	5	23	3
Second	590	159	27	49	8	32	5
Third	431	81	19	22	5	12	3
Total	726	[3] 357	49	105	14	67	9

[1] Includes returns with both stumpage and log prices given.
[2] Excludes 65 returned unclaimed. Nonresponse—348.
[3] Excludes 19 returned unclaimed. Nonresponse—350.

feasible method of sampling them was by 100 percent canvass of randomly selected areas. If reports were obtained for all mills, listed as well as unlisted, in these areas, they could be used to provide independent and unbiased estimates of the total mill population and of mean stumpage and log prices for all mills as well as for the new or unlisted mills.

As quality of timber and other characteristics affecting its price are subject to considerable local variation, wide geographic distribution of the sample was necessary. For this reason, the sample areas had to be small. Therefore, a comparatively large number of small areas was preferable to a few large ones. Another requirement was that their boundaries should be well defined for ease of working. Minor civil divisions (MCD's) seemed to meet these needs. Furthermore, detailed road maps with MCD's delineated were available for each county in both study areas.

The MCD's to be sampled were drawn from an alphabetical list using a table of random numbers. As a guide to deciding how many to draw, there was a count of sawmills by MCD's made in 1947. On this basis, 23 of the 146 MCD's in the Piedmont area and 38 of the 203 in the Coastal Plain area were selected.

Of 130 operators enumerated in the Piedmont MCD's and 126 in the Coastal Plain MCD's, 52 and 64, respectively, reported prices. The Piedmont count was 46 with stumpage price only, 4 with both stumpage and log prices, and 2 with log price only; the Coastal Plain count was 40 with stumpage price only, 18 with both stumpage and log prices, and 6 with log price only.

Twenty-five of the 116 reports with prices were for operators not on the 1947 list. In other words, the mail canvass and field follow-up of nonrespondents apparently failed to sample nearly one-fourth of the price-reporting population. If, for one reason or another, the unsampled mills paid different prices than the sampled mills, exclusive reliance on the out-of-date mailing list might seriously have biased the results of the price survey.

TABLE 3.—*Number of sawmills in sample MCD'S and stumpage and log price reports obtained, by study area and area sample*

Area sample	Mills in sample	Reports obtained with			
		Stumpage price [1]		Log price [1]	
		Actual	Percentage	Actual	Percentage
	Number	*Number*	*Percent*	*Number*	*Percent*
Piedmont					
Listed	85	35	41	6	7
Unlisted	45	15	33	0	0
Total	130	50	38	6	5
Coastal Plain					
Listed	97	48	49	23	24
Unlisted	29	10	34	1	3
Total	126	58	46	24	19

[1] Includes returns with both stumpage and log prices given.

Analysis of Results

Using the three classes of data (mail, nonrespondent, and area), it was possible to compute mean stumpage and log prices representing five alternative methods of sampling. The five sampling methods could then be compared on two counts—accuracy and cost.

Accuracy depends upon both sampling and non-sampling errors. Of these, non-sampling errors are the more difficult to evaluate and control. In the present instance, they include biases arising from reporting errors and from the use of a sample that is not representative of the entire population.

In comparing the five sampling methods, an attempt has been made to show the direction and the approximate extent of the non-sampling errors in total. Except by inference, there was no way to discover what types of biases were present or their relative severity. For instance, the study provided no specific test for reporting bias. However, by cross-comparison of means between classes of reports and survey methods, it was sometimes possible to identify a bias with some confidence.

All comparisons are in terms of stumpage price. Log prices were omitted partly because

TABLE 4.—*Mean stumpage price (based on lumber tally) and standard error, by class of report and study area*

Class of report	Piedmont			Coastal Plain		
	Reports	Mean price	Standard error	Reports	Mean price	Standard error
	Number	*Dollars*	*Dollars*	*Number*	*Dollars*	*Dollars*
Mailing						
First	23	18.32	[1] ±0.56	34	15.91	[1] ±0.57
Second	50	16.84	[1] ±0.30	49	14.30	[1] ±0.50
Third	9	17.78	[1] ±1.28	22	15.00	[1] ±0.81
Nonrespondent	37	16.43	±0.48	37	16.83	±0.70
Area						
Listed mills	35	17.43	±0.07	36	14.44	±0.09
Unlisted mills	15	17.80	±0.23	10	14.92	±0.16

[1] Not strictly valid, as the mail returns are not a random sample of the entire population, but these errors do provide a useful indication of the magnitude of the differences among means.

not enough data for close analysis were available and partly to avoid the complication of presenting duplicate comparisons. As stumpage price is, in effect, a derivative of log price, there is no reason to suspect that a similar comparison based on log price would lead to different conclusions.

Effect of Log Rules

As stumpage prices were reported in terms of various log rules, it was necessary, first to convert prices to a common base. Lumber tally, on which more than 75 percent of reported prices were quoted, was the base adopted. A mean price and standard error were then calculated for each class of report (table 4).

Estimates of mean stumpage prices were lower on the Coastal Plain than in the Piedmont for all classes of reporters except nonrespondents. This consistent difference was due largely to the prevalence of the use of the Doyle log rule on the Coastal Plain. This rule, when applied to logs of average size for the area, gives volumes one-third below what they will actually saw out, but Doyle prices did not reflect this fact. Thirty-six percent of the Coastal Plain operators reported prices based on Doyle rule as compared with only 1 percent of the Piedmont operators. Yet their mean price, before conversion to a lumber-tally basis, was $17.94 for three mailings, only $0.39 more than the $17.55 in the Piedmont. Converting all prices to lumber tally reduced the Coastal Plain price of $2.97 and the Piedmont price by only $0.19.

This effect of log rules was evident in interarea comparisons and in comparisons by class of report for the Coastal Plain alone. Apparently any price sample would be meaningless if it ignored the question of how volumes are measured, and biased if it failed to secure a correct representation of the various methods of measurement. This adds another source of price-survey bias to those previously mentioned.

Other Differences in Mean Price by Class of Report

In the Piedmont, mean stumpage prices ranged from $16.43 for nonrespondents to $18.32 for the first mailing, a gross difference of $1.89 (table 5). On the Coastal Plain, the low was $14.30 for the second mailing. High was $16.83 for nonrespondents, the class that paid the least in the Piedmont. This is a gross difference of $2.53 for the Coastal Plain.

The paradoxical situation of the highest-price class in one area paying the lowest in the other was explainable by the fact that very few of the Coastal Plain nonrespondents were reported as using Doyle rule, while a considerable number in each of the other reporting classes there did use it. Actually, aside from the differences introduced by log rules, prices in the two areas were rather similar, even to the trend in price by class of report. As a result, a few tentative conclusions can be drawn:

1. Stumpage buyers who responded to the

first mailing of questionnaires paid higher prices than those who responded to the second. The difference between means in the Piedmont was $1.48; in the Coastal Plain $1.61. This suggested the possibility of a correlation between price and promptness in responding, but the results of the third mailing did not support this hypothesis. This mailing brought a hodgepodge of high and low prices. The means were higher than for the second mailing in both survey areas, but not substantially so. As only 10 days separated the mailings, it is conceivable that a "carry-over" effect partly concealed the true relation (if any) between price and promptness of response.

2. The response hypothesis again received support, however, when the field sample of Piedmont nonrespondents was tested. Buyers of stumpage who responded to none of the mail requests tended to pay less than those who did respond, but the only pronounced difference was between the means of the first mailing and the nonrespondents and between the area means and the nonrespondents. The effect of log rules may have concealed comparable differences between the same classes of reports on the Coastal Plain.

In the last connection, it should be noted that 36 percent of the Coastal Plain respondents reported prices based on the Doyle rule, compared with only 11 percent of the nonrespondents. The reason for this apparent discrepancy is not definitely known, but there is strong reason to suspect reporting errors in the nonrespondent returns. The nonrespondent mean was extremely high compared to every other class mean on the Coastal Plain.

3. There was evidence that buyers on the 1947 mailing list paid less for stumpage than the new or unlisted buyers. The difference was significant at the 5-percent level on the Coastal Plain.

Accuracy and Cost of Price Survey Methods

Having compared the means from the three classes of reports (mail, nonrespondent sample, and enumeration of sample areas), the final step was to examine complete stumpage price surveys based on them. Five methods of survey were considered. They were (1) a straight mail sample, (2) mailings supplemented by a sample of nonrespondents, (3) mailings supplemented by an area sample of unlisted operators, (4) mailings supplemented by a sample of nonrespondents plus an area sample of unlisted operators, and (5) a 100-percent canvass of randomly selected MCD's.

All five methods were subject to reporting errors, which may have differed as between mail and interview reports. But the last two

TABLE 5.—*Differences in mean stumpage price, by class of report and study area*

Class of report and area	Mailing		Non respondent	Mills in area sample	
	Second	Third		Listed	Unlisted
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
First mailing					
Piedmont	+1.48	+ .54	+1.89	+ .89	+ .52
Coastal Plain	+1.61	+ .91	− .92	+1.47	+ .99
Second mailing					
Piedmont	----------	− .94	+ .41	− .59	− .96
Coastal Plain	----------	− .70	−2.53	− .14	− .62
Third mailing					
Piedmont	----------	----------	+1.35	+ .35	− .02
Coastal Plain	----------	----------	−1.83	+ .56	+ .08
Nonrespondent					
Piedmont	----------	----------	----------	−1.00	−1.37
Coastal Plain	----------	----------	----------	+2.39	+1.91
Listed mills in area samples					
Piedmont	----------	----------	----------	----------	− .37
Coastal Plain	----------	----------	----------	----------	− .48

methods (4 and 5) should have been otherwise free of bias. The entire stumpage-buying population was given representation, and the sampling was random. Method 2, on the other hand, failed to sample the unlisted operators—nearly 25 percent of the population. Method 3 failed to sample the nonrespondents, or 50 percent of the population. As for the mail surveys, they had to stand or fall on the risky assumption that neither the unlisted operators nor the nonrespondents paid prices different from those paid by operators who reported by mail. Yet, against the theoretical superiority of methods 4 and 5 had to be balanced the likelihood that one of the more questionable methods might yield sufficiently precise estimates at lower cost. To investigate this possibility, a collection of the better of the unbiased estimates was set up as a standard by which to judge the accuracy of the others. The area sample (method 5) was the standard selected, as it had the smallest sampling error.

The first step in the comparison was to compute the standard error of the difference between the area mean and the mean obtained by each of the other survey methods. Any difference between means in excess of this standard error was attributed to bias in the method under examination and was tested for significance (table 6).

Three mean prices with significant biases were disclosed. In the Piedmont, the mail survey adjusted for nonresponse (method 2) showed a negative bias of $0.45. At two standard errors, bias was still present. On the Coastal Plain, both method 2 (mail survey adjusted for nonresponse) and method 4 (mail survey adjusted for nonresponse and unlisted mills) showed bias in excess of three standard errors. As both of these Coastal Plain means involved the suspect nonrespondent sample (see above), the highly significant biases probably arose from reporting errors.

The lack of bias in the straight mail survey and its introduction when the nonrespondents were sampled was contrary to the findings of several experimental surveys conducted by the Bureau of Agricultural Economics, the Bureau of the Census, and others. A clue to this discrepancy was the fact that the new or unlisted sawmills paid more for stumpage than those on the 3-year-old mailing lists. It seems likely that the negative bias incurred by omitting the unlisted mills compensated for the expected positive bias of the mail sample. Adjustment of the latter sample for nonresponse destroyed this chance balance. If this interpretation is correct, a straight mail survey based on an up-to-date list would be biased by omission of the nonrespondents. However, at least for the study area, the bias would not be serious enough to invalidate the use of such a survey. It would still be possible to obtain a mean price sufficiently accurate for most purposes.

TABLE 6.—*Mean stumpage price, standard error, and estimated difference by survey method and study area*

Method	Mean price	Standard error	Difference
		Piedmont	
	Dollars	*Dollars*	*Dollars*
Mail survey			
1. Unadjusted	17.36	[1](±0.24)	— .18±.26
Adjusted for—			
2. Nonresponse	16.79	[1](±0.29)	[2]— .75±.30
3. Unlisted mills	17.51	(±0.41)	— .03±.42
4. Nonresponse and unlisted mills	17.10	±0.42	— .44±.43
5. Area survey	17.54	±0.09	
		Coastal Plain	
Mail survey			
1. Unadjusted	14.97	(±0.28)	+ .43±.29
Adjusted for—			
2. Nonresponse	16.00	(±0.35)	[3]+1.46±.36
3. Unlisted mills	14.96	(±0.32)	+ .42±.34
4. Nonresponse and unlisted mills	15.81	±0.40	[3]+1.27±.41
5. Area survey	14.54	±0.08	

[1] Not strictly valid as the returns used are not a random sample of the entire population, but these errors do provide a useful indication of the accuracy of the differences among means. The error equations for the mean prices obtained by the various survey methods were developed by R. A. Chapman of the Forest Service. Their development is based on Deming's propagation of error equation (see "Statistical Adjustment of Data," by W. Edwards Deming, pp. 39, 40). Copies of these equations can be obtained from the authors.

[2] Indicate bias in excess of 2 standard errors of the difference.

[3] Indicate bias in excess of 3 standard errors of the difference.

Reporting errors aside, all five survey methods appeared capable of producing price estimates of acceptable accuracy. Therefore, selection of a method might well be based on the comparative costs and personnel requirements. In other words, the most suitable method for a particular survey is the one that meets the specified standard of accuracy at the lowest cost and can be carried through with the type of personnel available.

Records of the experimental surveys gave the following direct costs of sampling:

$0.09 per questionnaire mailed
3.54 per nonrespondent interviewed
18.49 per MCD canvassed.

Using these costs and the estimated variances and biases of the different methods, it was possible to predict the cost of surveys of any desired degree of accuracy. In the case of combined samples (for instance, mail plus unlisted mills), the most efficient combination of sample intensities could also be calculated. Table 7 shows for each of the five survey methods the probable cost of obtaining a mean price within ±$0.50 of the true mean, taking into account both the sampling error and the expected bias, if any.

TABLE 7.—*Direct cost of estimating stumpage price, by survey method* [1]

Method	Cost [2]
	Dollars
Mail survey	
1. Unadjusted	133
Adjusted for:	
2. Nonresponse	1,374
3. Unlisted mills	774
4. Nonresponse and unlisted mills	1,705
5. Area survey	91

[1] Excluding supervision and other overhead.
[2] Cost of estimating stumpage price within ±0.50 (2 standard errors + bias).

The estimates in table 7 reflect the extent of estimated bias attributed to the survey procedure. If less bias is assumed, with more of the variation attributed to sampling errors, the estimated costs for methods 2 and 4 would be less than indicated in table 7.

Apparently, the area estimate is not only the most precise of those studied but the most efficient as well. However, under the conditions in the area of the study, its efficiency was only slightly greater than that of the straight mail estimate, and it requires the services of a canvasser. It should be pointed out that this study applies to only two sample areas. Additional studies in similar areas probably would have to be made before it would be possible to conclude definitely that straight mail estimates are satisfactory for this type of population. If an agency that wanted information as to stumpage prices were primarily an office organization, it might prove cheaper to make a mail survey than to hire and train a field man and provide him with automobile transportation. As for the surveys using combined samples (methods 2, 3, and 4), their efficiency is extremely low by comparison with either the mail or area method. Their high cost and greater complexity rule them out of consideration.

If periodic price reports, either monthly or quarterly, were desired, it might be possible to combine area and mail samples to good advantage. Stumpage buyers enumerated in the sample areas could be placed on mailing lists. Once adequate lists were thus established, area canvassing might be restricted to the minimum necessary to replace losses and create samples of new sawmill operators.

Office Corrections for Bias in Mail Surveys

If lack of field personnel dictates the use of straight mail surveys, computational techniques can sometimes detect and correct biases due to nonresponse. Two such techniques were applied to the mail data from North Carolina.

One consisted of separating and weighting the response by sawmill production class. In this way, bias could be eliminated if it arose from a tendency for sawmills of different sizes to pay different stumpage prices and if also, their responses were not in proportion to their actual numbers in the various sizes.

First, all the mills on the mailing lists were classified according to the volumes of lumber they produced in 1946. The mail returns, both with and without prices, then provided an estimate of the proportion of stumpage buyers in each production class. Finally, the reports with prices were sorted, class means computed, and the class means weighted by estimated proportions of buyers to obtain

grand means. Table 8 illustrates the method and compares the estimated distribution of buyers with the distributions of price reports from the mail and area surveys.

There was a tendency, particularly in the Piedmont, for the larger mills to pay more for stumpage. But this apparently introduced no bias, because all mill classes were properly represented in the mail response. In other words, the distribution of price reports by mill-production class closely approximated the distribution of buying mills in the population. As a result, the weighted price was identical ($17.36) with the unadjusted price in the Piedmont and differed by only $0.10 in the Coastal Plain.

Although all mill-production classes were properly represented in the total mill response, this was not true of the response to individual mailings. The larger mills, which paid the higher prices, were quick to return their questionnaires. Most responded to the first mailing.

TABLE 8.—*Estimated distribution of buyers on the 1947 mailing list, and of the mail and area survey price reports and mean stumpage price paid by mail respondents, by mill production and study area*

Mill production, 1946	Piedmont			
	Distribution of buyers			Mean stumpage price
	1947 list	Survey price reports		
		Mail	Area	
1,000 board feet	*Percent*	*Percent*	*Percent*	*Dollars*
0–49	12	16	10	16.00
50–499	33	36	30	17.04
500–999	36	32	32	17.88
1,000–2,999	19	16	18	17.80
3,000 and over			10	
All classes	100	100	100	17.36
	Coastal Plain			
0–49	9	6	8	14.88
50–499	34	37	40	14.66
500–999	23	19	21	14.77
1,000–2,999	28	29	23	15.14
3,000 and over	6	9	8	15.10
All classes	100	100	100	14.87

This explains the extremely high average price for the first mailing in the Piedmont and, to a lesser degree, the first mailing in the Coastal Plain (table 4).

Weighting a sample on the basis of a several-years-old production classification is open to one serious objection: The mills may no longer be producing at the same rate. Annual production of small sawmills is determined more by the number of days operated than by the capacity of the machinery. A change of ownership, or merely a change in the price or manufacturing cost of lumber, can shift a mill from one production class to another. Also, a change of ownership may of course be accompanied by a change from high-priced to low-priced stumpage, or vice versa.

The second method of removing bias from mail surveys, known as the "method of repeated mailings," [1] was based on the possibility of a correlation between an operator's willingness to respond and the price he paid for stumpage. It consisted essentially of fitting a regression to the trend of the average prices paid by respondents to successive mailings. In the Piedmont, the method gave a mean $0.10 less than the unadjusted mail price; in the Coastal Plain it was $0.44 less. Probably neither of these differences is meaningful, for the correlation was weak. Contrary to what would have been expected had there been strong correlation, the estimate based on the second mailing of questionnaires was lower than that from either the first or third.

Three Kinds of Mean Prices

The mean stumpage prices discussed above have been means obtained by summing the reported prices and dividing by the number of reports. In other words, they are mean prices per reporter, that is, buyer. They ignore the fact that some buyers purchase more, or larger, boundaries of timber than others. As our principal interest was in comparing price-survey methods rather than in the prices themselves, unweighted means served the purpose. Ordinarily, however, another kind of

[1] HENDRICKS, W. A. ADJUSTMENT OF DATA FOR NONRESPONSE IN MAIL SURVEYS. From "The Agricultural Estimating and Reporting Services of the U. S. Department of Agriculture", U. S. Dept. Agr. Misc. Pub. 703.

mean would be more suitable.

When a stumpage price survey is made, it is usually with the object of estimating either the mean price per 1,000 board feet of all the timber purchased (or sold) in an area during a specified time, or the mean price per 1,000 board feet of all the timber tracts purchased (or sold). The former represents, among other things, the average raw-material cost of lumber production; the latter represents the average price per timber transaction. They are obtained by weighting each reported price by the reporter's volume of purchases in board feet or number of tracts, respectively. Table 9 offers a comparison, for the present survey, of the unweighted mean prices with those weighted by January-April quantities of reported stumpage purchases.

With certain exceptions, notably the first mailing in the Piedmont, the weighted prices are higher than the unweighted. The price per tract slightly exceeds the price per buyer and, in turn, is exceeded by the volume price. The inference is not only that the larger buyers paid more for timber than the smaller buyers, but that the highest prices were paid for the larger tracts, that is, those with a greater-than-average volume. Thus, in planning a survey, it is essential that the reason for collecting price information be kept in mind. Provision can then be made for obtaining the kind of mean prices desired.

TABLE 9.—*Mean stumpage price, unweighted and weighted, by class of report and study area*

Class of report	Mean stumpage price		
	Unweighted	Weighted by	
		Tracts	Volume
	Dollars	*Dollars*	*Dollars*
Piedmont			
Mailing			
First	18.32	17.64	17.80
Second	16.84	16.85	16.91
Third	17.78	18.26	20.82
Nonrespondent	16.43	16.20	16.24
Area			
Listed mills	17.43	17.45	18.00
Unlisted mills	17.80	17.78	18.87
Coastal Plain			
Mailing			
First	15.91	16.31	16.39
Second	14.30	14.52	14.59
Third	15.00	15.61	17.17
Nonrespondent	16.83	17.92	17.87
Area			
Listed mills	14.44	14.65	15.00
Unlisted mills	14.92	14.97	17.55

Realized Versus Reported Prices

To estimate accurately volume in standing trees is a somewhat complex and time-consuming task. The "cruise" of a tract of timber also calls for experienced judgment of timber quality which is a highly variable factor even within the operating radius of a single sawmill.

Farmers and other owners of small woodlands are generally unable to appraise their own timber. A few call upon public foresters or consultants for assistance, but most of them enter timber transactions with little knowledge of the quantity or value they offer for sale. Under these circumstances, their only protection is to sell on the basis of log or lumber measurement or to encourage competitive bidding. Unfortunately, the former is an often inconvenient method of selling so that lump-sum transactions predominate, while competition among buyers is seldom so intense as to assure an equitable price.

Confronted by uninformed sellers and by the expense and possibility of misjudgment involved in making thorough appraisals of their own, prospective buyers are likely to rely on rough approximations that allow liberal margins for error. The consequent overrun when the timber is cut results in a "realized" price per 1,000 board feet that is substantially below the price received for measured timber.

As the primary object of the present survey was to ascertain the cost of raw material to lumber manufacturers, the question arose as to what sort of prices had been reported on the stumpage price questionnaires. Accordingly, a random sample of 34 recently cut-over sale areas, ranging in size from 1 to 192 acres, was drawn. The timber on each of these areas had been purchased and logged by one of the sawmill operators who reported prices.

After the tracts were selected, the land-owners were interviewed to obtain information per-

tinent to the sales—notably, the total price received. Tract boundaries were then mapped on aerial photographs by ground reconnaissance and the acreages planimetered. The 34 tracts totaled 1,411 acres.

The next step was to estimate the actual volume logged from the sample areas. A stump tally was taken of 183 one-fifth-acre circular plots, which were allocated to tracts according to the reported volume sold and were mechanically located within tract boundaries. In addition to a complete tally of stumps by diameters and heights, the utilized length and the diameter at the top of the utilized length were measured on every fifth-cut tree. Net plot volumes were expanded to full tract size and summed to obtain an estimate of the volume logged from all 34 tracts. This amounted to 7,491,000 board feet of pine and 1,609,000 of hardwoods, a grand total of 9,100,000 board feet with a standard error of ±388,000 or 4.3 percent.

Summing the total prices received by the landowner-sellers gave $128,737 as the amount actually paid for all the timber on the 34 tracts. It is, of course, free of sampling error. A corresponding grand total of $172,516 was obtained by multiplying each buyer's reported average price by the estimated logged volume of the tract he had purchased and summing these tract totals. This figure, which represents what the 34 tracts should have brought had each buyer paid for the full logged volume at the average price he reported, is subject to the variances of the estimates of volume for the individual tracts and has a standard error of ±$7,491.

Dividing the two total prices by the estimated total volume gave a realized mean price of $14.15 per thousand board feet for all 34 tracts as compared to a mean of $18.96 based on the questionnaire prices. The $4.81 difference between the two is significant at the 1-percent level.

Thus it appears that in cases in which realized stumpage prices are desired, the average prices reported by sawmill operators may require correction. The ratio "realized price: reported price" provides this. In the present case, it is merely the ratio of the two total prices and equals 0.746. The standard error is .0324 or 4.3 percent.

Summary

The test of the several methods for estimating the average price of pine stumpage in the two areas of North Carolina led to the following conclusions:

1. Any price sample would have been biased that ignored the question of how volumes were measured or that failed to secure a correct representation of the various methods of measurement, that is, lumber tally and log rules.

2. Stumpage buyers who paid the highest prices were the first to respond by mail. Thus, a number of mailings was necessary to minimize bias from this source.

3. Mail nonrespondents tended to pay less than respondents.

4. Evidence was present that new or unlisted operators of sawmills paid more for stumpage than the listed operators.

5. Tests of the differences between means disclosed some biases but none severe enough to invalidate the use of any of the survey methods tried.

6. The area survey yielded estimates of acceptable accuracy at a lower cost than any other method; the straight mail survey ranked second. Neither weighting by mill-size class nor the "method of repeated mailings" made any significant differences in the mail means.

7. When planning a stumpage price survey, one must decide what kind of mean price is desired—whether per buyer, per transaction, or per 1,000 board feet purchased—and must design the questionnaire accordingly.

8. The volumes of timber logged from boundaries overran buyers' estimates, with the result that actual realized prices averaged only 75 percent of reported prices.

Effect of Personal Visits on Response Rates to Mail Surveys

By Cecil C. Smith

Achieving a high rate of response to a mail survey is important from several viewpoints. Aside from any statistical considerations, it is obviously a waste of time and money to address envelopes and to mail questionnaires to people who do not return them. The statistical aspects of the problem are even more serious. A low return usually means that the reported data are not representative of the universe the investigator is trying to sample. The various geographic areas may not be covered in their proper proportions and the few people who do respond from each locality may differ considerably from the average in that locality with respect to the item being estimated. Such differences tend to be predominantly in one direction. They lead to serious biases for which satisfactory adjustments cannot always be made. Even when the bias is kept under control by interviewing samples of nonrespondents, investigators find that it pays to have a high response to the mailed inquiry. The higher the response, the smaller the sample of interviewed nonrespondents needs to be to attain the desired level of statistical precision. Rates of response can be stimulated by several different devices. This paper considers one of these—the effects of personal visits to the individuals on a mailing list.

STATISTICIANS who conduct mail surveys know that individuals who receive mail questionnaires are more likely to fill them out and return them when they have had some previous personal contacts with representatives of the agency that sends the questionnaires. There has been some question as to the length of time the stimulating effect of a visit to a potential respondent will be maintained when he is asked thereafter to return questionnaires regularly at periodic intervals. This is the situation with the general crop reporters who are asked to report crop conditions and miscellaneous other agricultural data once a month. After they are recruited and show some interest in reporting, they are requested to continue reporting as long as their interest in the work justifies their being kept on the mailing list.

Many reporters report regularly over long periods. Others report only occasionally unless some action is taken from time to time to stimulate their interest. With the limited resources available in many State Statisticians' offices it is difficult to maintain close personal contacts with a large number of reporters in a State. It is therefore well to know how much improvement from such contacts can be expected in the reporters' performance and how long the effects of a single visit will hold up.

In May 1949 the State Statistician of Idaho started a test on the 74 general crop reporters who were carried on the mailing list for Ada County, Idaho. By taking every other name on the list half of the number was selected for personal visits. The visitor was able to call on 13 reporters a day. These visits made in May 1949, were the only ones made.

When the selected reporters were visited most of them appeared to be interested in discussing crop reporting and related activities. One reporter remarked that he would be more inclined to report regularly if he were personally acquainted with the people to whom he was reporting.

A number of the reporters were obviously not much interested in crop reporting. Judging from their general attitudes and the nature of their farming operations they would not be likely to become good regular reporters. Uncovering such dead wood is itself a useful byproduct of personal visits to the people on a mailing list. Ordinarily such individuals would be culled from the list, but to make this a fair test they were allowed to remain.

Before any reporters were visited, 28 percent of those on the half of the list selected for

visiting returned their completed May crop-report schedules. Of those on the other half of the list, 26 percent returned completed schedules. In other words, before the test was started the two groups of reporters were about equally good. But immediately after the May visits the percentage return jumped to 77 percent for the visited group, whereas the return for the unvisited group was only 29 percent.

This is a rather spectacular demonstration of the effectiveness of personal visits, particularly when it is remembered that some visited reporters were hopeless cases who would ordinarily have been dropped from the mailing list.

But it is more important to look at the degree to which this stimulating effect holds up. The chart shows the percentage return for each group of reporters for 21 months after the visits were made. It is easy to see that after almost 2 years the percentage return for the visited group averages in the neighborhood of 50 percent while the percentage return for the unvisited group averages in the neighborhood of 25 percent, or about the same as at the start of the test. The trend shown for the visited group indicates that this difference would remain about the same for quite a while longer.

Normal list mortality prevented the test from being continued any longer. Although 28 of the visited reporters were still active, the unvisited group had dwindled to 19. This indicates another benefit from personal contacts. In addition to stimulating returns, visits appear to lower the mortality rate on lists.

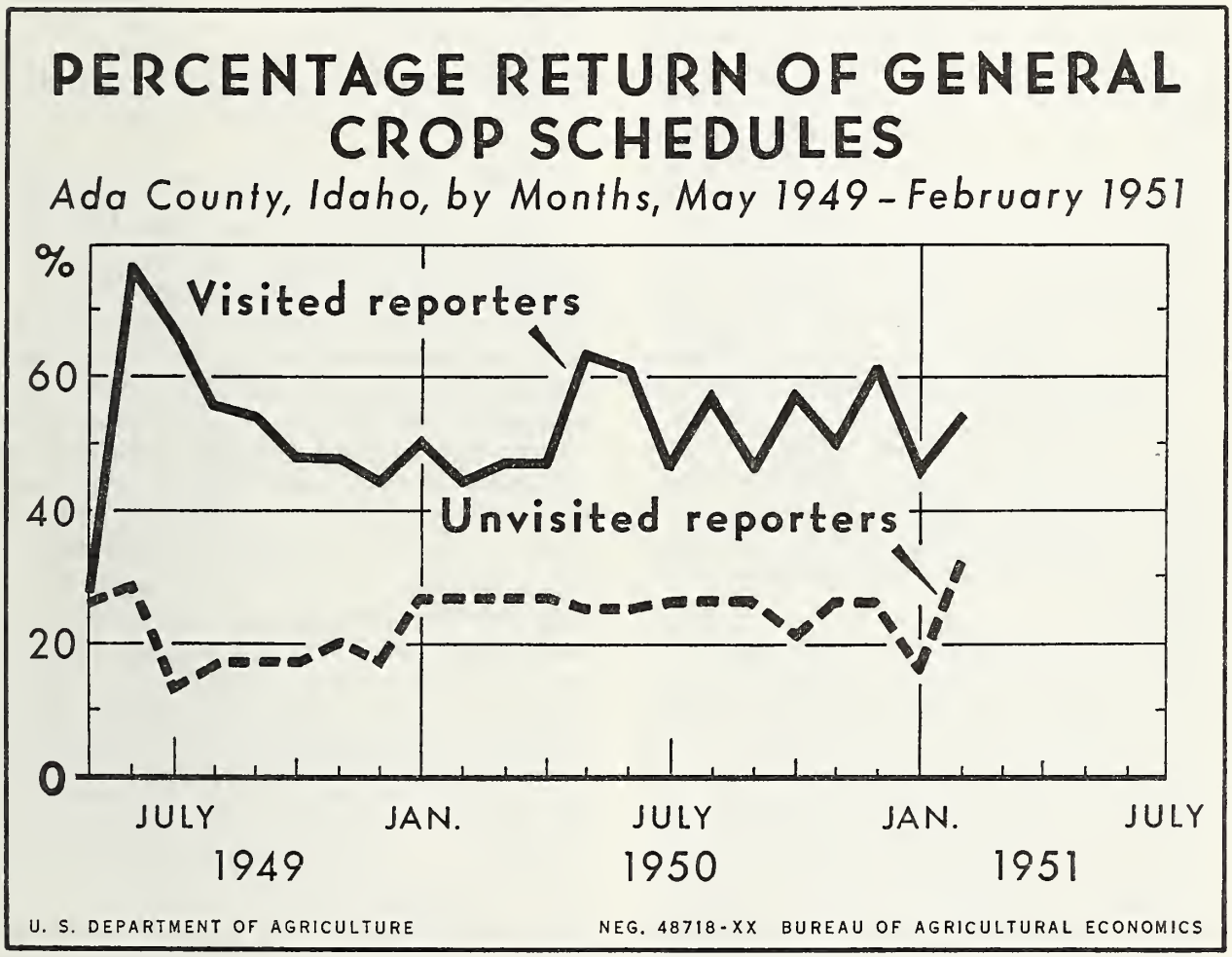


Figure 1

An Experiment in Marketing

By Glenn L. Burrows

The procedure of rating alternative retailing practices by totaling sales over a number of test stores and over a number of sales reporting periods implies certain tacit assumptions that are not always valid. In this article, several important requirements for an analysis of variance of retail-store data are discussed and shown to be not unusually restrictive. Variance analysis of sales data obtained from a latin square experiment is illustrated. The results are similar to, but more meaningful than, those obtained from analyses lacking clearly stated assumptions.

THIS PAPER deals with some of the uses and limitations of the latin square design with special reference to its use in the study of retail merchandising.

Presentation of Data

By way of illustration, part of the data reported by the Marketing and Facilities Research Branch of the Production and Marketing Administration in its publication *Merchandising Reconstituted Frozen Concentrated Orange Juice through the use of Mechanical Dispensers* is reproduced and analyzed as a complete experiment. As the data are based upon only a part of the experimental evidence, the reader is cautioned that the results obtained here are illustrative only. For the full implications of the experiment the reader is referred to the report itself. Data presented here are volumes of sales by months for six stores in Washington, D. C., for the 6 months beginning December 1, 1949. How the experiment was conducted should be clear from an examination of table 1. (Three different types of dispensers were used; but the "jug" methods of sale were identical, to provide replication in the experiment.)

Some apparent aspects of the data are the following:

Consider the ranking of stores, either by method of sale or by month, presented in table 2. It is clear that the stores would be unequal in their volume of sales of orange juice in any month even if they all used the same type of dispenser. In fact, in order of decreasing volume the ranking is almost certainly D, E, B, C, A, F. The single exception to the order D, E can easily be attributed to months. No exceptions to the order E, B occur. The single exception to the order B, C can easily be attributed to months. One of the two exceptions to the order C, A among stores ranked by method of sale (see column for dispenser 3) is easily attributable to months; of the three exceptions when ranked by months, that for February is inconsequential and that for April is attributable to the method of dispensing. The two exceptions to F occurring in last place are both attributable to the method of dispensing. In December both stores A and C used the jug method of sale, while store F used dispenser 3. In March, store F used dispenser 1, while store A again used the jug method of sale.

Confidence Reduced by Lack of Uniformity

Despite the fact that the same type and quantity of information as that supplying the ranking of stores by volume is available for a similar ranking of methods of sale, it is apparent from table 3 that such a ranking does not necessarily inspire the same confidence. The uniformity apparent in table 2 is no longer present. The inconsistencies there were easy to rationalize on the basis of experimental evidence or on an a priori hypothesis about customer predilection for dispensers in general, or both. But here the number and magnitude of inconsistencies increase the chance of error in an assertion that, had a particular store or group of stores used one method of sale rather than another for any particular month or group of months during the test period, its volume of sales would have been greater. Nevertheless, one of the primary objectives in assembling the data was ". . . to determine the effects of the use of mechanical counter-type machines (the dispensers) on sales volume. . . ." The dominant influence of store volume was anticipated; the

TABLE 1.—*Sales of reconstituted frozen concentrated orange juice from jug and mechanical dispensers in 6 test stores, Washington, D. C. by months, December 1, 1949, to May 31, 1950*

Method of sale (Juice container)	December		January		February		March	
	Sales	Store identification	Sales	Store identification	Sales	Store identification	Sales	Store identification
	Gallons		*Gallons*		*Gallons*		*Gallons*	
Jug 1	46.0	A	128.3	D	64.0	B	95.0	E
Jug 2	76.0	B	43.5	F	86.0	E	47.5	A
Jug 3	35.8	C	58.5	A	28.0	F	83.0	B
Dispenser 1	155.2	D	66.9	C	66.7	A	66.6	F
Dispenser 2	123.0	E	79.0	B	106.5	D	75.5	C
Dispenser 3	64.0	F	120.4	E	63.5	C	167.8	D
Total	500.0		496.6		414.7		535.4	

Method of sale (Juice container)	April		May		Total		
	Sales	Store identification	Sales	Store identification	Sales by containers	By stores	
						Store identification	Sales
	Gallons		*Gallons*		*Gallons*		*Gallons*
Jug 1	65.0	C	38.6	F	436.9	A	356.7
Jug 2	185.8	D	71.5	C	510.3	B	513.0
Jug 3	108.0	E	171.0	D	484.3	C	378.2
Dispenser 1	104.5	B	134.5	E	594.4	D	914.6
Dispenser 2	43.5	F	61.5	A	489.0	E	666.9
Dispenser 3	76.5	A	106.5	B	598.7	F	284.2
Total	583.3		583.6		3,113.6		

design incorporates special means of removing such influence and of assessing the reliability of the comparisons among the monthly totals. For example, in the first three rows of table 1 every month is linked to every other month by at least one identical store employing the same method of sale.

What is it that guides one to the choice of low- and high-volume months or of low- and high-volume methods of sale? Do the data conform to a preconceived hypothesis, or do they suggest hypotheses about low- and high-volume months and low- and high-volume methods of sale? Certainly, in the absence of any hypothesis, they are useless. Furthermore, the process of totaling—leading, as it does, to averaging—by months, by method of sale, or by stores, is not only confusing but also misleading unless some rather well-defined hypotheses are kept in mind, particularly in view of the numerous inconsistencies. When do totals (averages) and differences among them have real meaning?

Nature of the Analysis

It is clear that certain differences among stores have already been interpreted as real, and the only question to which this author seeks the answer is: Are not similar conclusions about months and methods of sale also possible? From the way in which this experiment was conducted, and in view of the stated objectives it is fairly obvious that some investigators will answer yes. Certainly some investigators will answer no, and the author conjectures that among them are those who will find little fault with his conclusion concerning store volumes or with its justification. Nevertheless, despite the number of inconsistencies and perhaps the lesser magnitudes among differences between sales for different methods of sale and between

different months, the same methods are available for comparisons as were available for comparisons between store volumes of sale.

Total sales for the three dispensers were 1,682.1 gallons as compared with a total of 1,431.5 gallons for the jugs; also dispenser 2, which is the only dispenser for which total sales did not exceed total sales of each of the three jugs, was used by the three largest-volume stores (as established earlier) in the three poorest months (ranked on the basis of monthly total sales). As an excuse for the low volume of sales for dispenser 2, however, such an argument is defenseless unless it is established that any increase in sales with the dispenser over those with jugs is larger for large-volume stores than for small-volume stores. This question could be asked regarding all the dispensers. An affirmative answer would invalidate the ordinary analysis of variance for this experiment. Rather, it would suggest the desirability of investigating constant ratios. For this reason, among others, readers are warned not to be misguided in the use of the latin square design by overenthusiastic advocates, who do not always state clearly the assumptions necessary to the proper interpretation of its analysis.

These assumptions are not necessarily formidable. In fact, they are no more restrictive than those required, although not so frequently stated, in less formalized analyses. An attempt is made to state simply the important assumptions and to illustrate how, through formalized analysis, they lead to useful conclusions.

It is assumed that the data are free from gross reporting errors. From the standpoint of the marketing researcher two requirements, called here constancy and equal variability, are particularly important, because they are frequently not met and because they affect the practical decisions to be made as a result of the analysis.

Constancy in this latin square means that volume of sales observed for a particular store in a given month depends upon the effect of the particular month, the same for every observation occurring in that month regardless of store or method of sale; upon the effect of the par-

TABLE 2.—*Stores ranked by volume of sales*

Volume of sales	Method of sale						Month					
	Jug			Dispenser			Dec.	Jan.	Feb.	Mar.	Apr.	May
	1	2	3	1	2	3						
Rank												
1	D	D	D	D	E	D	D	D	D	D	D	D
2	E	E	E	E	D	E	E	E	E	E	E	E
3	C	B	B	B	B	B	B	B	A	B	B	B
4	B	C	A	C	C	A	F	C	B	C	A	C
5	A	A	C	A	A	C	A	A	C	F	C	A
6	F	F	F	F	F	F	C	F	F	A	F	F

TABLE 3.—*Methods of sale ranked by volume of sales*

Volume of sales	Store						Month					
	A	B	C	D	E	F	Dec.	Jan.	Feb.	Mar.	Apr.	May
Rank												
1	D 3	D 3	D 2	J 2	D 1	D 1	D 1	J 1	D 2	D 3	J 2	J 3
2	D 1	D 1	J 2	D 3	D 2	D 3	D 2	D 3	J 2	J 1	J 3	D 1
3	D 2	J 3	D 1	J 3	D 3	[1] D 2, J 2	J 2	D 2	D 1	J 3	D 1	D 3
4	J 3	D 2	J 1	D 1	J 3	D 2, J 2	D 3	D 1	J 1	D 2	D 3	J 2
5	J 2	J 2	D 3	J 1	J 1	J 1	J 1	J 3	D 3	D 1	J 1	D 2
6	J 1	J 1	J 3	D 2	J 2	J 3	J 3	J 2	J 3	J 2	D 2	J 1

[1] Dispenser 2 and Jug 2 sold equal amounts in store F.

ticular method of sale, the same for any month and in any store in which the method is used; and upon the effect of the particular store.

The store effect has already been demonstrated to exist independently of the method of sale employed or the month in which it is observed. The combination of these separate effects constitutes all accountable reasons for the differences among the observations. It is possible to conceive of other effects that contribute to differences among the observed results; but formal analysis of the latin square provides for testing for the existence and estimation of the magnitude of only such effects as are postulated above.

The assumption of equal variability is necessary only if tests for the existence of effects are to be made in order to decide objectively such questions as the following: Is dispenser 3 really superior to dispenser 1? Is dispenser 2 really no better than the jug method of sale? Even in the absence of the assumption of constancy, certain comparisons of sale volumes, such as those for stores C and D in April with their respective values in May, measure only the effect of months. Surely the variability among such differences is some indication of the precision of measurement of the month effect. For store C the difference is 6.5 gallons and for store D it is −14.8 gallons.

Is it not necessary for the absolute difference (that is, disregarding sign) between volumes for two different methods of sale used by any store in these 2 months to exceed 14.8 gallons before a real effect can be established between methods of sale? It would certainly seem so if the differences for every store are measured with the same precision. This is precisely the reason why the assumption of equal variability is made. The measure of error inherent in such differences is a guide to the proper significance to be attached to differences observed among the effects of months. Similarly, such differences as those between volume of sales for stores A and B in December and in March should measure the effect of stores.

These two assumptions can be written succinctly as follows:

$$y_{ijk} = f(M, s_i, m_j, d_k, e_{ijk})$$

where: y_{ijk} = volume of sales (or a transformation thereof) observed for the ith store (i = A,B, ..., F) in the jth month (j = Dec., Jan., Feb. ... May) using the kth method of dispensing juice (k = jug 1, jug 2, jug 3, Dispenser 1, ... Dispenser 3)

f indicates a relationship with (dependency upon or function of) the quantities enclosed in its parentheses.

M = mean (average) sales for all stores over the test.

s_i = adjustment to M for the ith store because of its size.

m_j = adjustment to M for all stores in the jth month.

d_k = adjustment to M for all stores using the kth type of dispenser.

e_{ijk} = discrepance between observed sales (or its transform) and the combined postulated effects.

Note that the s_i is the same for store i in any month and when using any dispenser; similar statements hold for m_j and d_k. Also, it has been assumed that the variability among differences between two e's in the same row (that is, having same i = same store) is neither more nor less than that between two e's in the same column (that is, having same j = same month) and the same for that between e's with the same k (that is, for same dispenser). Now if sales (or some simple transformation thereof) can be shown to follow a simple additive relation (that is, $z_{ijk} = M + s_i + m_j + d_k + e_{ijk}$), where z_{ijk} is either y_{ijk} or some simple transform thereof, and the assumptions are correct, differences among totals for months, for stores, and for dispensers are efficient estimates of differences among the m_j's, s_i's, and d_k's, respectively. This is quite clear, for it is obvious that in differencing two such totals all effects subtract out except the particular one in question and some terms measuring discrepance from hypothesis; these are compared with differences that measure solely discrepance from hypothesis.

It is only under such assumptions that a latin square arrangement – and many other useful designs – eliminates the effects of nontest variables (store size, seasonal variation) from the comparison of the effects of the use of different dispensers upon volume of sales. The assumption of equal effects on stores of all volumes for different months and different dis-

TABLE 4.—*Expected sales of reconstituted frozen concentrated orange juice from jug and mechanical dispensers in 6 test stores, Washington, D. C., by months, December 1, 1949, to May 31, 1950*

Method of sale (Juice container)	December		January		February		March	
	Sales	Store identification	Sales	Store identification	Sales	Store identification	Sales	Store identification
	Gallons		*Gallons*		*Gallons*		*Gallons*	
Jug 1	42.6	A	135.0	D	54.5	B	100.2	E
Jug 2	80.9	B	42.2	F	92.4	E	60.8	A
Jug 3	54.1	C	50.0	A	24.2	F	82.5	B
Dispenser 1	161.9	D	71.9	C	54.7	A	62.7	F
Dispenser 2	103.0	E	76.8	B	130.1	D	60.8	C
Dispenser 3	57.5	F	120.7	E	59.0	C	168.5	D
Total	500.0		496.6		414.9		535.5	

Method of sale (Juice container)	April		May		Total		
	Sales	Store identification	Sales	Store identification	Sales by containers	By stores	
						Store identification	Sales
	Gallons		*Gallons*		*Gallons*		*Gallons*
Jug 1	60.1	C	44.5	F	436.9	A	356.8
Jug 2	161.7	D	72.4	C	510.4	B	513.1
Jug 3	116.1	E	157.5	D	484.4	C	378.3
Dispenser 1	108.8	B	134.5	E	594.5	D	914.7
Dispenser 2	53.1	F	65.2	A	489.0	E	666.9
Dispenser 3	83.5	A	109.6	B	598.8	F	284.2
Total	583.3		583.7		3,114.0		

pensers may not be appropriate. Perhaps the assumption of a constant percentage increase for all stores is more suitable. Thus, a change from the jug method of sale to a dispenser might be expected to effect a greater absolute increase in volume of sales for store D than for store F, even though the percentage increases are equal. A simple transformation to logarithms of the original observations renders the data suitable to the previous assumptions if constant rates can be assumed for stores, months, and methods of sale.

Adequacy of the Analysis

It may be instructive to examine the adequacy of the proposed hypotheses to represent the observed data. For such purposes, the sales to be expected on the basis of the hypotheses are presented in table 4, using the volumes of sales without transformation. Except for rounding errors, the totals for months, for stores, and for methods of sale are identical with those of table 1. The sensitivity of the hypotheses is apparent in reflecting the differences among the observed data. Table 5 shows the difference between the reported and expected sales.

To determine whether large errors are associated with large volumes of sales a number of measures might be thought to be useful. A simple correlation of the discrepances in table 5 with the reported sales in table 1 would be expected to be positive, under the hypothesis of constant percentage increases for stores, months, and methods of sale. Its value is .24. But, in applying the usual test of the correlation coefficient to decide whether this value differs significantly from zero, one difficulty arises from the fact that the discrepances in

table 5 are not statistically independent. Thus the test—a one-tailed test is appropriate—with n = N-2 = 36-2 = 34 would indicate correlations significantly greater than zero too frequently; in this instance a nonsignificant result is indicated. Readers who are familiar with the concept of degrees of freedom might propose to test this correlation coefficient at n = 20 degrees of freedom—the reason for the 20 degrees of freedom appears later. But even though this would yield fewer significant correlations, such an approximate test is still far from adequate.

A simple correlation of the discrepances in table 5 with the expected sales in table 4 is known to be zero by virtue of the hypothesis. It is therefore of no use as a test measure of degree of association. A simple correlation of the discrepances in table 5 with a measure of store volume of sales will provide no criterion for rejecting the hypothesis of equal store effects, for it too must be zero, no matter what measures are used for store size.

Another proposal might be a simple correlation of the absolute values of the discrepances in table 5 with either reported sales, as in the first measure considered, or with some measure of store size, as in the third measure considered. The latter was computed, using inverted ranks as an indication of store size, and found to be .0015. The difficulty of interpreting the significance of this measure would usually be as great or greater than that encountered with the first measure discussed. But it would hardly be necessary to investigate the significance of so small a correlation coefficient.

One simple test would be appropriate and adequate in one special instance, although it is an over-all test of the adequacy of the combined hypotheses. The chi-square test would require that one size of serving glass be used in all stores with all methods of sale during all test periods. Except for a constant multiplier, depending upon the size of glass used, it involves squaring the discrepances in table 5, dividing by the corresponding entry in table 4, and summing over-all entries.

Unfortunately, this test would not generally be applicable, nor is it in the present study. Here the same choice of two sizes of glasses was offered in every store, and the price for each choice was the same for all stores. If such a test were to indicate that the data departed significantly from the hypothesis, it would doubtless be desirable, and at first glance possible, to separate chi square into portions attributable to various possible causes as, for example, the contribution to the measure of departure made by large and small stores as opposed to those of average volume. In the present state of statistical knowledge this is too much to require, for the same lack of independence among the discrepances prevents a separation of chi square into such meaningful portions. It is possible to decompose it, but only into components whose practical significance is difficult to interpret.

From the foregoing discussion it is seen that a number of frequently used techniques must be interpreted with caution. They are mentioned

TABLE 5.—*Differences between reported and expected sales of reconstituted frozen concentrated orange juice from jug and mechanical dispensers in six test stores, Washington, D. C., by months, December 1, 1949, to May 31, 1950*

Method of sale (Juice container)	December		January		February		March		April		May	
	Sales	Store identification	Sales	Store identification	Sales	Store identification	Sales	Store identification	Sales	Store identification	Sales	Store identification
	Gallons		*Gallons*		*Gallons*		*Gallons*		*Gallons*		*Gallons*	
Jug 1	3.4	A	— 6.7	D	9.5	B	— 5.2	E	4.9	C	— 5.9	F
Jug 2	— 4.9	B	1.3	F	— 6.4	E	—13.3	A	24.1	D	— 9.9	C
Jug 3	—18.3	C	8.5	A	3.8	F	0.5	B	— 8.1	E	13.5	D
Dispenser 1	— 6.7	D	— 5.0	C	12.0	A	3.9	F	— 4.3	B	0.0	E
Dispenser 2	20.0	E	2.2	B	—23.6	D	14.7	C	— 9.6	F	— 3.7	A
Dispenser 3	6.5	F	— 0.3	E	4.5	C	— 0.7	D	— 7.0	A	— 3.1	B

here only to illustrate the dangers in applying inefficient, and even inappropriate and uninterpretable, techniques.

How to Perform the Analysis

Regardless of the size or sizes of glasses employed in dispensing the juice—as long as the same sizes are used with all dispensers—an analysis of variance is possible for deciding the question of whether some methods of sale really sell more juice than do others. Such analyses under the two different sets of hypotheses, together with some comments on their interpretation, follow.

TABLE 6.—*An analysis of variance for stores, months, and methods of sale, by constant-additive and by constant-percentage effects*

Source of variation	Degrees of freedom	Sum of squares	Mean square	Ratio to error of mean square
	Additive			
Stores	5	46,617.79	9,323.56	55.2
Months	5	3,386.31	677.26	4.0
Methods of sale	5	3,492.90	698.58	4.1
Error	20	3,380.68	169.03	
	Percentage			
Stores	5	1.1124	0.2225	42.9
Months	5	.0792	.0158	3.1
Methods of sale	5	.1271	.0254	4.9
Error	20	.1037	.0052	

In the analysis of variance in table 6, the total variability exhibited by the data in table 1, that is, the sum of squares of the differences between each entry and the mean of all entries, has been split up into four portions—stores about the mean, months about the mean, methods of sale about the mean, and a portion designated as error. This error sum of squares is nothing more than the sum of the squares of the discrepances in table 5. Except for rounding errors, totals for stores, months, and methods of sale in table 5 are all zero.

Comparable to the chi-square test discussed above, one might suggest the ratio of the error sum of squares to total sum of squares as a measure of adequacy of the hypothesis. For the additive hypothesis this ratio is .0594 and for the percentage hypothesis .0739. Thus the hypothesis of constant additive effects accounts for about 94 percent of the total variability among the data in table 1, and the hypothesis of constant percentage effects accounts for about 93 percent of the variability among the logarithms of the data in the same table.

Incidentally, one often finds in marketing literature objections to the use of correlation and regression techniques, yet the same authors claim advantages for the analysis of variance; the test of the measure of adequacy just described, however, is precisely the test of the multiple correlation of sales with store, month, and dispenser effects. The use of the latin square and the analysis of variance is only a different formal presentation of the results of a regression or correlation analysis; the tests available with one method are available with the other and are equivalent.

The ratios of the mean squares for the separate effects to that for error are the test criteria for establishing the significance of those effects. The large ratio for stores as compared to that for dispensers merely reflects what was observed earlier by the method of ranking. Despite the predominance of variability among stores, opportunity is afforded here for some definite conclusions with respect to dispensers. In fact, the F-test indicates highly significant differences among the effects of dispensers on sales under either set of assumptions. Numerous exact or approximate tests are available for testing for real differences between specific stores or groups of stores and between different methods or grouped methods of sale.

Table 7 shows the ranked mean sales for the various methods of sale. Two different methods of averaging produce two different rankings, a fact that should caution against any hasty adoption of either ranking to the exclusion of the other, as neither method has any unusual claim to superiority.

An approximate method by Tukey for comparing means was unsuccessful in either case in establishing any superior or inferior methods or groups of methods; a method due to Duncan indicated that both dispenser 3 and dispenser 1 were superior to jug 1, jug 3, and dispenser 2.

TABLE 7.—*Method of sales of orange juice ranked by arithmetic mean and by geometric mean monthly sales*

Arithmetic mean		Geometric mean	
Method of sale	Mean monthly sales	Method of sale	Mean monthly sales
	Gallons		*Gallons*
Dispenser 3	99.8	Dispenser 3	93.5
Dispenser 1	99.1	Dispenser 1	93.0
Jug 2	85.1	Dispenser 2	77.0
Dispenser 2	81.5	Jug 2	75.1
Jug 3	80.7	Jug 1	66.9
Jug 1	72.8	Jug 3	66.9

The mean sales for jug 2 did not differ significantly from any of the other means. But the exact student test for comparing the mean for dispensers with the mean of jug sales indicates in both cases that, on the average, dispensers have a highly significant superiority over the jug method of sale. An approximate test suggested by the data indicate further that dispensers 1 and 3 are superior to dispenser 2. As might be suspected from the data, no test indicated definitely a superiority of dispenser 3 over dispenser 1.

Conclusion

It has been shown that two different sets of assumptions lead to approximately the same conclusions; the only valid measures of adequacy of the hypotheses were about the same for both sets. Many researchers suppose that some statistical test should exist to aid in the selection of one or the other set. But in both instances, the conclusions are derived from the assumptions, and they clearly cannot serve in addition as a basis for determining which set is the more acceptable.

Book Reviews

Land for Tomorrow. By L. DUDLEY STAMP. Indiana University Press, Bloomington, and American Geographical Society, New York. 230 pages. 1951. $4.00.

THIS IS ANOTHER BOOK about the world food problem (with a few comments on minerals and a plug for mapping present land-use) by a professor of geography at the London School of Economics. It is based on a series of lectures given by the author at Indiana University in 1950.

Progress toward the solution of this problem is such a stern and urgent challenge to Western Civilization that any book that may encourage people to study it is welcome. This one will be useful to those who have not yet studied the problem, provided they follow it up with specific discussions of the factors involved and of constructive suggestions about how to develop the potentialities of land and people.

Dr Stamp's intentions are obviously in the public interest as viewed by an English professor who has travelled widely (and well) and who wants to be helpful. The book has many good paragraphs about ideas that need frequent restatement and repetition. Yet these are diluted with others that are too general or too platitudinous to be rewarding.

The point emphasized on the dust jacket is surprising, as its author suggests, ". . . that the most important undeveloped lands are not in the Tropics and uninhabited latitudes, as we might expect; the hope for land development lies in the middle latitudes, in the United States, the Soviet Union, Canada, Australia, and the Argentine . . ." Indeed surprising! Perhaps enough to make the book sell. Fortunately, however, this is not what the author says. He writes, ". . . that there are greater immediate prospects of increasing agriculture output in the middle latitudes than there is of securing immediate help in the world food

situation from much more difficult tropical lands." What a difference! With the word "immediate" added (and twice) the author's statement agrees with the view of every professional agriculturist of my acquaintance who has studied in both places.

We have two sorts of soil potentialities: (1) for increasing both yield and production efficiency on the soils now being farmed, and (2) for finding new acres of responsive soils, many of which may need careful management for efficient production. Obviously, the best *immediate* prospects are in areas of high present economic activity and well-developed education in technology.

But the long-time view, perhaps in 25 years, perhaps in 100 years or longer, is a different matter. The author emphasizes in a quotation from J. D. Black that by and large each country shall need to work out the problem for itself. About Point Four in this connection, the author suggests by delicate inference that it is —well, he is very cautious, perhaps "overoptimistic" is the strongest word he would permit in a summary. I should not want to imply that I knew exactly what President Truman had in mind when he gave his famous Point Four message, but it seems fair to suppose that he was taking a long view, and of people as well as of land, and that no matter how long it took, now was none too early to start.

The author does not give a definite summary of his own ideas of potentialities in the Tropics. He rightly emphasizes that techniques cannot be transferred directly from temperate regions to the Tropics. This is probably the most important contribution of the book. Probably every leading professional agriculturist would agree, if we leave out the techniques for basic research, *which can be transferred*. Yet, it is vital not to leave them out, but rather to concentrate on this level of science where direct transfers can be made.

Dr. Stamp gives many examples of difficulties, including, of course, the failure of the British Groundnut Scheme in East Africa. He has much less to say on the constructive side. Curiously, he has not a word about the excellent work of the British agriculturists in the Sudan, nothing about the highly successful Gezira Scheme, and he just mentions the great agricultural research program in the Belgian Congo. A few hopeful possibilities are suggested, but he finds it easier to "explain" the failures.

At least to this reviewer, his picture of the Tropics is weak and unbalanced. Certainly it will take imagination and hard work to bring forth the agricultural plenty in the Tropics from soils so unlike those of the middle latitudes. But it wasn't easy years ago to develop the central part of North America with the tools then available.

Nevertheless, Dr. Stamp's emphasis on the difficulties of technical assistance to undeveloped countries may be all to the good. The American people especially need to realize how hard it is to do a successful job and that essentially every American technician who has a better than even chance for success will be one taken from a piece of important work in our own country.

A book on this subject needs figures, and accurate ones are as hard to come by as the author suggests. The errors in the available figures are compounded by two difficulties: (1) Failure to appreciate the enormous differences in both present and potential response to management among contrasting kinds of soil and (2) a failure to distinguish between "soil," primarily a concept of natural science, and "land," primarily a concept in social science. Throughout, Dr. Stamp uses the word "land" for both "soil" and "land," so that his meaning is often obscure. Thus, some of his conclusions from the comparisons of yields per acre or acres per person are not valid because of great contrasts in soil, in the economic characteristics of land, or in both. Nor do summaries "average out" on a country basis.

He compares, for example, the "average farm" of the United States with that of England and Wales. He says, "I am well aware of the artificial character of an 'average' farm." But obviously he isn't; because he draws such conclusions as the one that the British farm is larger and better stocked than the American. A part of the soils in the United States are comparable to those in Britain, but certainly not the soils in the South, the Great Plains, or the far West.

More curious is his use of "efficiency" in

country comparisons of agriculture. "In a world short of food," he writes, "it is surely clear that what matters is the actual amount of food produced, so, making some allowance for quality, the higher the output per unit area, the greater the efficiency of the farmer." By this calculation, "efficiency" is relatively low in the United States, again as an average. Yet later, he points out that something must be wrong with that approach and suggests that the amount of labor used is not immaterial. He says with ". . . the concept of efficiency as measured in terms of output per man-hour, then clearly every extension of mechanization is likely to lead to increased efficiency." With this concept, he still finds parts of Canada and of the United States ahead of Britain. But he balances this by the "damage done to the soil since the sods were first turned by the pioneers"—damage to show up later in production figures, one assumes. With so much juggling of figures, it is strange how he avoided the concept of output per man-day-acre, or of input-output ratios, considering all production factors. Yet despite these curious calculations, he comes out for the family farm in temperate regions.

Dr. Stamp gives strong emphasis to the desirability of freer trade among countries, especially through the "iron curtain" and the "dollar curtain." Many will agree and hope that he gathers converts, but he has no suggestions for bringing it about.

The book contains one specific suggestion which we can only hope will not be taken seriously. This is a scheme for a world land-use survey. Although he suggests in passing that basic facts are needed, such as soil surveys and the like, he urges this proposal of classifying and mapping present land use. The results of such a survey, *following* a good soil survey, or concurrently with it, have some use. They permit comparisons between present use and potential use that highlight the critical areas needing attention in agricultural research and service programs.

Yet by itself, a survey of present land use is of little value. The land-use pattern is the combined results of many factors—soil, ownership, and other institutional characteristics of land, location, both local and general economic conditions, skills of land occupiers, and so on. Because an area is or is not used for sugarcane tells us very little about its potentialities and management requirements. Even in many local communities, for institutional reasons, we may find excellent farms, poor farms, and wild land on different areas of the same kind of soil having identical basic potentialities. In fact, maps of present land use as the primary basis for agricultural planning have probably led to more mistakes than otherwise.

As the author explains, land use has been mapped in Britain. In relation to cost and the time of both paid and voluntary personal services, its values to *agriculture* is highly questionable, except as an interesting sort of "Domesday-Book" record that permits comparisons between present land use and potentialities where basic surveys have been made.

Basic surveys that can give us a clear concept of potentialities are needed. In agriculture, this gets back mainly to climate and soil, including slope, stoniness, texture, chemical composition, and all the many other soil characteristics that determine how an area responds to management. Badly as staff and funds are needed for these basic surveys essential to developing efficient sustained systems of farming in both presently used and unused areas, it would be a great pity indeed if they were used instead for any general program of land-use mapping.

Dr. Stamp avoids strong statement. Greatly to his credit, he does not try to scare his readers. He quotes from some who do, especially on the matter of soil erosion. Although a bit lacking in any sense of urgency, the writing is simple and easy to read.

Charles E. Kellogg

Agricultural Prices. By FREDERICK LUNDY and RICHARD JAY FOOTE. McGraw-Hill Book Company, New York. 2nd Edition. 509 pages. 1952. $6.50.

THE REVISED EDITION of this well-known textbook presents an up-to-date analysis of agricultural prices. Although the material is set in the old framework with emphasis upon basic principles, the earlier text has been largely rewritten. The addition of new sections represents the progress in analysis in this field in the 16 years since the first edition was published.

The first half of the book deals with the principles of price determination. The explanation of demand and supply relationships touches on all the fundamentals, yet remains elementary and uncluttered. New material on aggregative demand, business fluctuations, and imperfect competition is incorporated. The key importance of aggregative demand in price analysis is stressed. The problem of business cycles or fluctuations is approached in a semi-historical fashion by presenting briefly various "cycle theories," none of which is very convincing. The authors then point to the confusion that exists and warn against simple explanations of the business cycle.

In a brief treatment, the advantage to the forecaster of using the income-stream approach to measure demand is presented in simple terms. The nontechnical explanation of the four major sectors of demand provides a key to modern forecasting. These sectors are (1) net exports or imports (net foreign investment), (2) private capital formation, (3) Government, and (4) consumers. (This is called "savings of individual consumers" in the text, but is usually thought of as "consumer expenditures." This makes the four parts add up to total product, or income.) A brief section on the problem of preventing inflation during wartime follows. The proper measures include higher taxes with a broad base, higher interest rates, the avoidance of direct controls, and an improvement in general public understanding of the nature of inflation.

The influence of imperfect competition is described, with special emphasis upon price discrimination. This section is developed with scrupulous care to keep away from the difficult terms and concepts usually employed in this field. For example, marginal curves are avoided by employing curves for total cost and total returns and maximizing the spread between the two in order to determine the most profitable price for a firm. One paradoxical result obtained by the authors is that retail prices of the great bulk of food are determined under conditions of pure competition but that marketing margins are determined largely under imperfect competition—a conclusion that did not seem convincing to this reviewer.

The second part of the book, which deals with analytical methods of price analysis, is an excellent introduction for students who have not had courses in statistics. The material is carefully graded and marked as the exposition progresses to more complicated problems. A portion of the latter may be unsuited to elementary classes but it furnishes a valuable guide for those who wish to learn about present-day price and demand analysis and forecasting. This section, together with the examples of price analyses of the principal farm products in the final part of the book, shows the methods to be followed, as well as the solution, of a considerable number of the practical though technical problems encountered in such work. Examples of the practical problems dealt with include (1) years to be included, (2) crop years versus calendar years, (3) the particular price or income series to be used, (4) the type of equation, (5) time, and lags, (6) per capita and deflated data, and (7) intercorrelation among the independent variables. Although some of these problems are discussed in statistical textbooks, the treatment in *Agricultural Prices* is especially appropriate for the student or research worker in this field. Price analyses are developed for livestock and meat, dairy products, poultry and eggs, fats and oils, grains, cotton, and wool.

With the exception of the short section already mentioned, the remaining portion of the book is at a suitable level for use in introductory classes. Each of the commodity analyses, together with the references cited, provides a grounding for more intensive research.

L. Jay Atkinson

Price Policies in the Cigarette Industry. A Study of "Concerted Action" and Its Social Control, 1911-50. By WILLIAM H. NICHOLLS. The Vanderbilt University Press, Nashville, Tennessee. 464 pages. 1951. $6.00.

THE INDUSTRY here involved has been frequently cited as a prime example of oligopoly and oligopsony. One of Nicholls' goals was to arrive at prescribed steps that would improve the social performance of the industry. Formulation, even in general terms of possible courses of action, is challenging. Nicholls has some suggestions, but the likelihood of their being adopted seems to be remote.

The possibility of another try at dissolution is considered, but the practicable problems of dividing a single brand present extreme difficulty. Each of five big firms has largely concentrated on one major brand although, in the last few years, one of these has pushed a second brand of "king size" length up among the leaders. Nicholls recognizes that dissolution in the cigarette industry would be extremely disruptive and even unfair if other oligopolies were left untouched. A broadly based public policy to reverse the drift toward large-scale concentration would necessitate new Federal legislation and strengthening of existing law.

Another remedial action suggested by Nicholls would be "social control of advertising." In his view, advertising is a focal point in the monopoly problem in the cigarette industry. Outlays for advertising large enough to get a foothold in the market act as an effective bar to new entrants. Price competition among cigarettes has been almost nonexistent for a decade. Nicholls believes that placing a ceiling on advertising outlays that would be substantially below current levels would diminish the advantage of the few dominant cigarette firms and help to establish a more competitive industry.

A course of action to make the cigarette industry more competitive has been before Congress several times, and is suggested by Nicholls. This is substitution of a graduated tax, or even an ad valorem tax, for the present flat tax. The flat tax, having no relation to the retail price but applied only to numbers of cigarettes, has been burdensome to the economy brands.

Nicholls mentions the reactions of growers to the graduated-tax proposal back in the 1930's. It is regrettable that he did not give more consideration to this aspect, especially in the light of the overwhelming opposition of growers to a graduated tax when it was under consideration by Congress in 1950. A more thorough investigation and discussion of possible economic effects of a graduated or an ad valorem tax on the interests of tobacco growers would have been a valuable addition to this book. Proposals to modify the present flat tax on cigarettes have been hotly debated and more light needs to be shed on this matter.

Nicholls takes a rather critical view of the Federal tobacco program. He gives inadequate consideration to the importance and difficulty of the problem of exports that faced tobacco growers during World War II and the postwar years. His reference to producer referenda on marketing quotas as creating "a facade of democratic procedure" seems unwarranted, as the legal requirement that at least *two-thirds* of the growers must approve, to place a quota in effect, is a substantial safeguard. In fact, referenda have failed to produce the necessary margin in favor on eight occasions (five before the preface date of this book), refuting his point that approval of quotas is "overwhelmingly assured." Nicholls enumerates several "undesirable longer run economic effects to which such programs lead." Some points are of doubtful validity and he fails to note desirable long-run effects that should be placed in the scale in weighing Federal programs. Nevertheless, his criticism should be helpful in the continuous reappraisal of Federal programs that must be made by growers, their legislative representatives, and administrators.

The chapters that discuss the course of the 1940-46 antitrust case—charges, evidence, argument, legal theory—in the District Court, the Circuit Court of Appeals, and the Supreme Court, are well done. The volume contains much statistical data, including 87 statistical tables pertaining to the cigarette industry. The numerous historical series on prices, output, costs, sales, income, profits, and purchases will make the book a valuable reference volume.

Arthur G. Conover

Statistical Services of the United States Government. By the OFFICE OF STATISTICAL STANDARDS, United States Bureau of the Budget. Rev. ed., 78 pages. Washington, D. C., 1952.

THE PURPOSE of this booklet, as stated in its introduction, is "to provide a general description of the economic and social statistical programs of the United States Government—where they are located, how the data are collected, and what data are available in these areas from Federal agencies."

As the Office of Statistical Standards serves as the central coordinating agency for the Government's diversified statistical activities, it is in position to know all the ramifications of the great mass of data relating to many subjects, that is collected and analyzed by the various agencies.

Since the passage of the Federal Reports Act in 1942, any agency of the Federal Government must obtain the approval of the Budget Bureau for any request for information to be sent to 10 or more respondents. This means that no statistics may be collected without examination and approval of the Bureau of the Budget, which delegates this authority to the Office of Statistical Standards. This office takes the leadership in developing uniform standards for use by all agencies. It serves also as the focal point for United States participation in the statistical activities of international organizations.

Almost every agency of the Government collects or uses statistics. This booklet groups the agencies into three broad categories of statistical responsibilities, although it points out that the three types are not mutually exclusive. There are: (1) the general-purpose statistical agencies, which include, among others, the Bureau of the Census, the Bureau of Labor Statistics, the Bureau of Agricultural Economics, and the National Office of Vital Statistics in the Public Health Service; (2) the administrative and regulatory agencies, such as the Social Security Administration and the Bureau of Employment Security in the Department of Labor, which obtain statistics as a byproduct of their administrative or operating responsibilities, and those regulatory agencies such as the Federal Power and the Interstate Commerce Commissions; and (3) the analytic and research agencies, which do not themselves collect statistics but which compile, analyze, or interpret statistics collected by other agencies. An example of this third group is the Council of Economic Advisers in the Executive Office of the President, which analyzes and interprets economic trends.

Part I concludes with a discussion of "General Principles and Practices," including such subjects as adaptability of the program to emergency needs, use of sampling, and protection of the confidential nature of information from individual respondents. The discussion of Federal-State relationships in statistical work emphasizes the independence of the States in this field. Several instances of Federal-State cooperation are mentioned, but the omission of any reference to the high degree to which such cooperation has been developed in agricultural statistical reporting seems a gross oversight.

In Part II of the booklet, in which the principal types of economic and social statistics are briefly described, some rather interesting facts come to light. To mention only a few, we learn that the statistical series on work stoppages (strikes and lockouts) in the United States goes back to 1881; that the index of retail prices prepared by the Bureau of Labor Statistics was initiated in World War I, for use in wage negotiations, particularly in shipbuilding centers; and that statistics showing Treasury receipts, expenditures, and surplus or deficit, date back to 1789.

An Appendix lists in convenient form the statistical responsibilities of Federal agencies. Also included is a bibliography of the principal periodical statistical publications issued by them.

On the whole, this booklet should prove useful to anyone interested in statistics on a particular subject or collected by a particular agency. It will perhaps be especially useful to statisticians in the Federal and State agencies.

Esther M. Colvin

The Legal Status of the Tenant Farmer in the Southeast. By CHARLES S. MANGUM, JR. The University of North Carolina Press, Chapel Hill. 478 pages. 1952. $7.50.

HERE IS A WEALTH of material on the development of the law concerning farm tenancy and cropping contracts in the Southeast. The region delineated for study is composed of 11 States: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. In his preface the author states that an "analysis of the statutes and appellate court decisions has been attempted with a view to obtaining a treatise which would be useful to lawyers, sociologists, *agrarian economists* [italics ours], and agriculturalists alike." He adds the hope "that the suggestions made with respect to changes in the statutes will be considered by state legislators with a view to the clarification and modernization of the law. . . ."

As a general rule, the author takes up one subject at a time, traces its historical development, and describes the current status of the law, including its variations throughout the region. He usually comes to some conclusion regarding the adequacy of the law, primarily from the standpoint of the farm tenant or cropper, and often makes suggestions for alleviating its inadequacies. Subjects covered include, among others, the distinction between tenancies and cropping contracts, the different types of tenancies, rights in crops, priority of liens, improvements and repairs, option contracts, and cropper's rights. He becomes convinced that certain statutes and court decisions are unsuitable to agricultural communities and that farm tenancy law has long favored the landowner at the expense of the tenant. His concluding chapter discusses "suggested reforms to alleviate [the] plight of farm tenants and to modernize laws pertaining to the landlord-tenant relationship." An index aids in finding references to the law in the respective States.

This book supplies an interesting and informative source of knowledge for law professors, practicing lawyers, and perhaps other legally trained persons. The author is a lawyer and speaks the lawyer's language. But just where its usefulness lies for agricultural researchers, instructors, and extension workers is not so clear. In the first place, many undefined legal terms and otherwise difficult passages have been employed.

A wholly adequate presentation of the farm tenancy law of 11 States is at best a tremendous task. The author covers some subjects on a State-by-State basis, but he does not cover every State on every subject. While there is no settled law on certain subjects in some States, the author does not always make it clear that this is the case when one or more States are omitted from the discussion. This would create difficulties for a reader who is interested in the law of a particular State.

The type of study upon which the book is based also tends to limit its usefulness. It is largely a discussion of statutes and reported appellate court decisions, that is, the law in the books. Relatively few controversies are brought into court, and even fewer reach the appellate courts. Many readers would like to know how things are commonly settled out on the farm, in law offices, and in the lower courts. To what extent and in what manner are tenancy laws, as formulated in the statutes and reported court decisions, actually applied? This question is left unanswered.

Farm tenancy is a good example of the interrelationships that often exist between law, economics, and rural sociology. It is sometimes difficult to say just which phase of the subject should be considered primarily economic and social, with legal implications, or primarily legal, with economic and social implications. In this area no one field of inquiry can progress satisfactorily without the others. The author has made a commendable attempt to interrelate these fields, but this cannot be done effectively without a closer look at what lies beyond the law books. For this and other reasons his attempted integration is only partially successful.

This book fills only a segment—but an important segment—of the research that is needed. The agricultural economy of the Southeast is undergoing significant developments that call for a continuing inquiry into the effect or lack of effect of farm tenancy laws upon agricultural production and conditions, and what new adjustments should be sought through educa-

tion or legislation. Many of the author's conclusions in this regard are no more than partially proven, though several would definitely be useful in formulating hypotheses to be tested in further research. Such research would call for the combined talents of both legalists and agriculturists – legalists who see the agricultural setting and agriculturists who see the legal setting.

Harold H. Ellis

What Happens During Business Cycles. WESLEY C. MITCHELL. National Bureau of Economic Research. 386 pages. 1951. $5.00.

Conference on Business Cycles. National Bureau of Economic Research. 427 pages. 1951. $6.00.

FOR FORTY YEARS Wesley C. Mitchell was a pathfinder in business-cycle research. His last volume does not differ in form from his previous work in the National Bureau of Economic Research, which involved massive compilation of data, the development of statistical techniques to measure business cycles, and the behavior of the several sectors of the economy during those cycles. In this respect, there has been substantial progress. Mitchell's series now number 800. These have been compared with reference cycles, a means of averaging business cycles; the series conformity to business cycles and the amplitudes of their rise and fall have been measured individually; and finally, attention has been given to their cycle-by-cycle variability. Mitchell's death interrupted the logical conclusion of this study—the analysis of the processes of expansion, recession, contraction and revival, out of which Mitchell hoped to find the answer to "how an economic system of interrelated parts develops internal stresses during expansions, stresses that bring on recessions, and how the uneven contractions of its varied parts pave the way for revivals."

While the most rewarding part of the study is yet to come from Mitchell's colleagues at the National Bureau, Mitchell's book is rewarding, particularly to the technicians who are working on business-cycle analysis. Even for those with only a general interest in the subject, examination of the tables and charts will provide stimulating exercise in rationalizing why some series behave as they do. It should be noted that Mitchell does not claim anything significantly new—and in fact his report leans toward understatement. He writes that in large part his summary of what happens during a typical business cycle "repeats what has been known to careful observers, merely putting familiar impressions into definite form." It should be noted also that in the search for regularity in behavior ". . . what we have learned concerning the behavior of time series by analyzing hundreds of them . . . leaves us with a healthy respect for the potency of irregular movements."

The second book, which contains the proceedings of the Conference on Business Cycles held in November 1949 under the auspices of universities and the National Bureau, is an important contribution to business-cycle research. All viewpoints of thought in this field are ably represented and spiritedly contested. This collection of papers and comments on papers given at the Conference yields the impression that a transition phase is at hand in business-cycle research. It is significant that the leaders of the two dominant schools of thought in this field in the past have been lost in recent years—Joseph A. Schumpeter, the exponent of the historical approach to the analysis of business cycles, as well as Mitchell. Schumpeter makes a cogent appeal for his approach in this volume.

The introduction to Mitchell's book, written by Arthur F. Burns, serves also as the principal contribution concerning Mitchell's work in this volume. But it is abundantly clear that there is considerable dissatisfaction on the part of some with the progress in Mitchell's approach of painstaking examination series by series, as well as the inadequacies of the historical approach toward the development of the compre-

hensive theory of business cycles. The viewpoint of the econometricians that a system of structural equations can be developed which will describe the operations of the economy and the theory of business fluctuations is ably presented by Jacob Marschak, Carl Christ, Jan Tinbergen, and Lawrence Klein. Christ's paper has special importance in that he tested the predictive ability of an econometric model prepared by Klein with some modifications by Christ and found that the model fared no better than a "naive" model which simply extrapolated the value of each variable from the preceding year or the trend between the two preceding years.

Nathan M. Koffsky

Selected Recent Research Publications in Agricultural Economics Issued by the Bureau of Agricultural Economics and Cooperatively by the State Colleges [1]

ANDERSON, ROICE H. TRENDS IN CHICKEN SLAUGHTER AND PRICES IN THE WESTERN STATES. Utah Agr. Expt. Sta. Special Rept. 5, 15 pp., illus. May 1952. (RMA; Agr. Expt. Stas. of Calif., Oreg., and Wash.; BAE; and PMA cooperating.)

Chicken slaughter in both the United States as a whole and the Western region increased strikingly during the 1940's. Chicken slaughter per capita in the Western States in recent years has been less than 60 percent of the United States average. Price differences between classes of chickens at major United States markets, particularly between light and heavy hens, have been greater since World War II than during the war. Price differences between light and heavy hens were greater at San Francisco and Los Angeles than at Midwestern and eastern markets.

BADGER, HENRY T. MARKETING CHARGES FOR HEAD LETTUCE SOLD IN CLEVELAND, OHIO, FEBRUARY-JUNE 1950. U. S. Dept. Agr. Marketing Research Rept. 6, 24 pp. June 1952. (RMA)

From February through June 1950 for size—48 head lettuce from California and Arizona, marketing margins from f.o.b. shipping point through each step in the marketing process to consumers in Cleveland averaged $4.85 a crate, or 61 percent of the consumer's dollar.

BADGER, HENRY T. MARKETING CHARGES FOR HEAD LETTUCE SOLD IN PITTSBURGH, PA., DECEMBER 1949-JUNE 1950. U. S. Dept. Agr. Marketing Research Rept. 4, 26 pp., illus. April 1952. (RMA)

Provides specific information on marketing margins for lettuce according to size of head and producing areas. Pricing policies and margins are shown for retail stores according to their methods of buying produce.

BANNA, ANTOINE, ARMORE, SIDNEY J., and FOOTE, RICHARD J. PEANUTS AND THEIR USES FOR FOOD. U. S. Dept. Agr. Marketing Research Rept. 16, 99 pp. 1952. (RMA)

Brings together the statistical and economic information that is available concerning the food uses of peanuts, other than crushing for oil. Discusses the major factors that affect consumption in the several alternative outlets and includes background material on trends in production, foreign trade, and domestic crushing.

BARLOWE, RALEIGH, and HARTMANS, ERMOND H. SOME ASPECTS OF FARM HOUSING AND SERVICE BUILDINGS IN MICHIGAN. Mich. Agr. Expt. Sta. Tech. Bul. 232, 31 pp., illus. June 1952. (BAE cooperating)

Most all of the 216 farmhouses studied were single-family, detached dwellings. Approximately nine-tenths of them were frame with solid masonry continuous-type foundations. Rated according to structural level and conditions, 56 percent were found to have no deficiencies requiring early repair, 32 percent needed moderate repair, and 12 percent needed extensive repairs or complete replacement.

BUTLER, CHARLES P., and STREETMAN, HAROLD L., ECONOMICS OF MECHANICAL COTTON PICKING IN SOUTH CAROLINA. S. C. Agr. Expt. Sta. Bul. 399, 35 pp., illus. January 1952.

Based on 1950 results, total picker costs averaged $35 an acre for harvesting only 25 acres but dropped to $12 an acre when 100 acres were harvested. Hand-picked cotton was valued at 2.68 cents more per pound of lint than machine-picked cotton.

FELLOWS, I. F., FRICK, G. E., and WEEKS, S. B. PRODUCTION EFFICIENCY ON NEW ENGLAND DAIRY FARMS. 2. ECONOMIES OF SCALE IN DAIRYING—AN EXPLORATION IN FARM MANAGEMENT RESEARCH METHODOLOGY. Conn. (Storrs) Agr. Expt. Sta. Bul. 285, 47 pp., illus. February 1952. (RMA; BAE and N. H. Agr. Expt. Sta. cooperating)

[1] Processed reports are indicated as such. All others are printed. State publications may be obtained from the issuing agencies of the respective States.

The major purpose was to ascertain the relationship of size of enterprise to unit production costs in dairying in New England.

FISCHER, C. M. STUDIES IN TURKEY MARKETING IN THE WESTERN STATES. PART 1. TRENDS IN THE PRODUCTION OF MARKET TURKEYS IN THE UNITED STATES 1929-49 WITH SPECIAL REFERENCE TO THE WESTERN STATES. PART 2. RAILROAD RATES ON DRESSED TURKEYS TO NEW YORK, BOSTON, PHILADELPHIA, AND CHICAGO FROM TEN SURPLUS TURKEY PRODUCING STATES. Utah Agr. Expt. Sta. Special Rept. 6, 16 pp., illus. (RMA; Agr. Expt. Stas. of Calif. Oreg., and Wash.; BAE, and PMA cooperating.)

Because of substantial increases in production of turkeys in the last 20 years, the Western region faces increasing competition in selling its turkeys in eastern markets. The industry can (1) curtail production by eliminating the less efficient producers; (2) change to production of a smaller variety of turkey; (3) improve methods of marketing the large turkeys now produced; or (4) expand western markets so that more western turkeys are consumed in the region. In railroad rates, midwestern, southwestern, and eastern shippers have an advantage over shippers in the far West.

FLAGG, GRACE L., and LONGMORE, T. WILSON. TRENDS IN SELECTED FACILITIES AVAILABLE TO FARM FAMILIES. U. S. Dept. Agr. Agr. Inform. Bul. 87, 15 pp., illus. May 1952.

Facilities included electricity, electrical equipment, refrigeration, radios and television, telephones, housing, running water in farm dwelling, central heating, automobiles, and all-weather roads.

FOSSUM, M. TRUMAN. MARKETING INFORMATION FOR COMMERCIAL FLORICULTURE. PRELIMINARY REPORT. 21 pp., illus. July 1952. (RMA)

. . . MARKETING INFORMATION FOR COMMERCIAL ORNAMENTAL HORTICULTURE. PRELIMINARY REPORT. 21 pp., illus. July 1952. (RMA)

Census data indicate that the retail and service trade resulting from distribution of flower, nursery, bulb, flower seed and vegetable seed crops amounted to more than $1 billion at the midpoint of the twentieth century. Floricultural crops accounted for $650 million, and nursery, bulb, flower seed, and vegetable seed crops were the major components of the remaining $350 million.

FOWLER, HERBERT C. CHANGES IN DAIRY FARMING IN THE NORTHEAST, 1930-51. 55 pp., illus. U. S. Dept. Agr. Agr. Inform. Bul. 86, June 1952.

From 1935 to 1951, the average dairy farm in the Northeast increased about 12 percent in total number of acres, 38 percent in number of cows milked, and 67 percent in quantity of milk produced. On January 1, 1952, the market value of real estate, machinery, livestock, and feed was about $27,200 per farm compared with $11,100 in 1930 and $8,400 in 1935.

GARROTT, WILLIAM N. MARKETING CHARGES FOR POTATOES SOLD IN CLEVELAND, OHIO, FEBRUARY-JUNE 1950. U. S. Dept. Agr. Marketing Research Rept. 21, 28 pp., illus. 1952 (RMA)

Analyzes data relating to store cost of and selling prices for potatoes obtained for 1,543 lots, of which 137 were traced from the terminal market back to shipping point to obtain applicable marketing charges.

GARROTT, WILLIAM N. MARKETING CHARGES FOR POTATOES SOLD IN PITTSBURGH, PA., DECEMBER 1949-JUNE 1950. U. S. Dept. Agr. Marketing Research Rept. 5, 28 pp., illus. May 1952. (RMA)

The average retail selling price for the potatoes sold in 30 sample stores during the 7 months was 4.6 cents a pound. The average retail margin was equal to 17.8 percent of the consumer's dollar spent for these potatoes, and the wholesale margin was 9.6 percent. Information on brokerage and transportation charges is also given.

HARRINGTON, A. H., and CALHOUN, WENDELL. THE DAIRY BALANCE OF THE PACIFIC SLOPE. Wash. Agr. Expt. Sta. Sta. Cir. 191, 17 pp., illus. May 1952. (RMA; BAE cooperating.)

In 1949, apparent consumption of dairy products in the seven States of the Pacific Slope was about 3 percent more than regional milk production. Annual milk production in the region by 1960 is estimated at 12,500 to 16,500 million pounds. Estimates of consumption plus offshore shipments range from 14,100 to 18,100 million pounds. High production combined with low disposition, would result in surpluses. Lower production, combined with high consumption and increased outshipments, would require large supplies of dairy products from outside the region.

HECHT, REUBEN W. LABOR AND POWER USED FOR FARM ENTERPRISES, IDAHO, 1950. 42 pp. Bur. Agr. Econ. June 1952. (Processed.)

Tables and discussion show results of a questionnaire as to man-hours of labor required to grow crops, raise the various kinds of livestock, and maintain the farm.

HEMPHILL, PERRY V., and MARTIN, LLOYD C. A SELECTED BIBLIOGRAPHY OF POTATO MARKETING RESEARCH (1930-1950). N. Dak. Agr. Expt. Sta. Bul. 373, 39 pp. June 1952. (RMA; BAE cooperating.)

Relates primarily to the results of potato marketing research, exclusive of articles in periodicals, in the United States since 1930.

HOCHMUTH, H. R. COMMERCIAL FAMILY-OPERATED SHEEP RANCHES, INTERMOUNTAIN REGION, 1930-50. ORGANIZATION, COSTS, AND RETURNS. U. S. Dept. Agr. Agr. Inform. Bul. 85, 71 pp., illus. May 1952.

These one-summer-band ranches average about 1,500 head of breeding animals. Their average total cash expenditures varied from about $3,370 in 1933 to $18,990 in 1950. Total cash receipts were about $8,500 in 1930 and about $26,000 in 1950.

HOGLUND, C. R. ECONOMY OF IMPROVED PRODUCTION PRACTICES ON SPECIALIZED DAIRY FARMS IN SOUTHEASTERN MICHIGAN. Mich. Agr. Expt. Sta. Agr. Econ. 491, 54 pp., illus. April 1952. (RMA; BAE cooperating.) [Processed.]

Production costs can be lowered and labor incomes increased on these farms by (1) using improved production practices to increase the productivity of the labor force, acreage of land, and kind of cow used; (2) having better cows in the dairy herd; (3) increasing the size of farm.

HOGLUND, C. R., and WRIGHT, K. T. REDUCING DAIRY COSTS ON MICHIGAN FARMS. Mich. Agr. Expt. Sta. Special Bul. 376, 31 pp., illus. May 1952. (RMA; BAE cooperating.)

Use of improved production practices and better cows in the herd can lower costs of production and increase labor incomes on Michigan dairy farms without increasing the number of men or the acres used in operating the farm business.

INDUSTRIAL SURVEYS COMPANY. PROBLEMS OF ESTABLISHING A CONSUMER PANEL IN THE NEW YORK METROPOLITAN AREA. An Agricultural Marketing Act of 1946 (RMA, Title II) Contract Report. U. S. Dept. Agr. Marketing Research Rept. 8, 41 pp. May 1952.

The two most troublesome problems encountered were high costs and missing data.

NORTH CENTRAL REGIONAL FRUIT AND VEGETABLE TECHNICAL COMMITTEE. STUDIES IN MIDWEST APPLE MARKETING. MERCHANDISING - PALATABILITY - MARGINS. Mich. Agr. Expt. Sta. Spec. Bul. 378, 75 pp., illus. June 1952. (North Central Regional Pub. 29; RMA; Agr. Expt. Stas. of Ill., Ind., Iowa, Kans., Mich., Minn., Mo. Nebr., N. Dak., Ohio, S. Dak., Wis.; and U.S.D.A. cooperating)

In the 19 Detroit retail stores studied, prices of apples and the size of the apple display affected the day-to-day changes in volume of sales of apples. On the basis of proportion of edible tissue and retail price, Midwestern apples were found to compare favorably with those from other areas. Western growers received about the same percentage of the consumer's apple dollar as those in the Midwest, but Western growers received a higher price for their apples.

RAPER, ARTHUR F. A GRAPHIC PRESENTATION OF RURAL TRENDS. 33 pp., illus. Ext. Serv. and Bur. Agr. Econ. Washington, D. C. 1952.

Contains facts and ideas for community meetings, vocational classes, farm or civic organizations, county or community extension planning groups, home demonstration groups, 4-H clubs, or staff conferences.

ROCKWELL, GEORGE R., JR. FLUE-CURED TOBACCO: PRICE DIFFERENCES AMONG TYPES 11(A)-13. U. S. Dept. Agr. Marketing Research Rept. 9, 12 pp., illus. 1952. (RMA)

Two aspects of flue-cured prices are given attention. One is the extent to which the average price of a group of United States grades differs from one type of flue-cured tobacco to another. The second is the way in which the average price of a group of a single type varies during the course of a marketing season and the factors that are apparently associated with this variation.

SARTORIUS, LESTER C., and BURK, MARGUERITE C. EATING PLACES AS MARKETERS OF FOOD PRODUCTS. A Research and Marketing Act Contract Report. U. S. Dept. Agr. Marketing Research Rept. 3, 118 pp. 1952 (BAE and Univ. Minn. cooperating.)

In 1948, eating places, institutions, and other large-scale feeding establishments marketed an estimated 16 percent of the total civilian food supply of the United States. Of the food supply for Minneapolis, Minn., 18 percent was so marketed, and of that for Fairmont, Minn., a small city, 16.5 percent.

STANFORD RESEARCH INSTITUTE. TRANSPORTATION AND HANDLING COSTS OF SELECTED FRESH FRUITS AND VEGETABLES IN THE SAN FRANCISCO BAY TERMINAL MARKET AREA. An Agricultural Marketing Act (RMA, Title II) Contract Report. U. S. Dept. Agr. Marketing Research Rept. 2, 65 pp., May 1952. (BAE cooperating)

One dollar of each five spent for food by civilian consumers is used to buy fruits and vegetables. Marketing and handling charges for fruits and vegetables accounted for an average of 65 cents of each dollar spent at retail for food in 1951. This indicates the importance of trying to find ways and means of reducing transporting and handling charges for fruits and vegetables.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. AGRICULTURE'S CAPACITY TO PRODUCE. POSSIBILITIES UNDER SPECIFIED CONDITIONS. U. S. Dept. Agr. Agr. Inform. Bul. 88, 62 pp., illus. June 1952 (Prepared under the auspices of the Land Grant College-Department of Agriculture Joint Committee on Agricultural Productive Capacity)

Appraisal of agriculture's productive capacity during the defense period indicates that a total farm output about 20 percent greater than in 1950 and 18 percent greater than in 1951 could be attained within the next 4 or 5 years, if necessary.

UNITED STATES BUREAU OF AGRICULTURAL ECONOMICS. SURVEY OF CANVAS AWNING FABRICATORS. U. S. Dept. Agr. Marketing Research Rept. 1, 79 pp. April 1952. (RMA)

Intended as an instrument for documenting a general impression of one segment of the textile field.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1952—202561

AGRICULTURAL ECONOMICS
RESEARCH

Is published quarterly by the Bureau of Agricultural Economics, U. S. Department of Agriculture. The printing of this publication was approved by the Director of the Bureau of the Budget, June 5, 1952.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 20 cents a single copy, 75 cents a year, domestic, $1 foreign.

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Agricultural Economics
Washington 25, D. C.

October 1952

INDEX, AGRICULTURAL ECONOMICS RESEARCH

VOLUME IV, 1952

	Page
Agricultural discontent, Middle West	96
Agriculture and the general economy	13
Bias, non-response, mailed survey	77
Business cycles	142
California	8
Capitalism	58
Cigarette industry	
economic analysis and public policy	25
price policies	139
Consumer acceptance and preference, defined	52
Cotton, mill consumption, factors affecting	44
Demand for agricultural products, forecasting	65
Eating places as food marketers	88
Econometrics	23, 100
Economic reality, analysis, history and theory	30
Economic resources and policies, Southern States	26
Economics, foundations of	30
Eggs, production, input-output relationships	1
Employment, economics of	22
Experiments, design and analysis	101
Farmhouses, structural level and condition, methods for reporting	33
Food	
distribution	83
policy	102
problem, world, and land use	135
procurement and production, wartime	31
Forecasting	
agricultural, evaluation	105
demand for agricultural products	65
Forest land, ownership, California	8
Forests and men	27
Free enterprise	57
Hunger	98
Index numbers	28
Inflation, economics of	59
Land use and the world food problem	135
Linear computations	61

Page

Marketing experiment..... 128
Mobilization, economics of..... 59, 60
Monopoly..... 57
Outlook, agricultural, evaluation..... 105
Policy sciences..... 99
Politics, Midwestern progressive..... 96
Population and food resources..... 98
Price policies, cigarette industry..... 139
Prices, agricultural..... 138
Research publications in Agricultural Economics.....32, 64, 104, 143
Scientific research..... 24
Southern States..... 26
Soybean processing industry, transportation economics..... 63
Stabilization, economics of..... 60
Statistical methodology, reviews of..... 61
Stumpage prices, estimating test of survey methods..... 115
Subsidies for farmers..... 29
Survey methods, for estimating stumpage prices, test of..... 115
Surveys, mailed
non-response bias..... 77
response rates, effect of personal visits..... 126
Statistical services, United States Government..... 140
Tenant farmer, legal status, Southeast..... 141

AUTHORS

Page

Allin, Bushrod W. Book Review: American Capitalism, by John Kenneth Galbraith..... 58
Atkinson, L. Jay. Book Review: Agricultural Prices, by Frederick Lundy Thomsen and Richard Jay Foote..... 138
Baker, Gladys L.
Book review: Food; Volume I, The Growth of Policy, by R. J. Hammond..... 102
Book Review: Wartime Food Procurement and Production, by Benjamin Baker..... 31
Baker, John D., Jr. Outlook Evaluation--Methods and Results. With Don Paarlberg..... 105
Burk, Marguerite C. Distribution of the Food Supply of the United States..... 83
Burroughs, Roy J. Surveying Structural Level and Condition of Farmhouses..... 33
Burrows, Glenn L.
Consumer Acceptance or Consumer Preference..... 52
An Experiment in Marketing..... 128

Page

Cavin, James P.
Book review: Economics of Employment, by Abba P. Lerner..... 22
Forecasting the Demand for Agricultural Products..... 65
Colvin, Esther M. Book Review: Statistical Services of the United States Government, by the Office of Statistical Standards, United States Bureau of the Budget..... 140
Conover, Arthur G. Book Review: Price Policies in the Cigarette Industry. A Study of "Concerted Action" and Its Social Control, 1911-50, by William H. Nicholls..... 139
Edwards, Everett E.
Book review: Agricultural Discontent in the Middle West, 1900-1939, by Theodore Saloutos and John D. Hicks..... 96
Book review: Midwestern Progressive Politics; A Historical Study of Its Origins and Development, 1870-1950, by Russell B. Nye..... 96
Ellis, Harold H. Book review: The Legal Status of the Tenant Farmer in the Southeast, by Charles S. Mangum, Jr..... 141
Finkner, A. L. Adjustment for Non-Response Bias in a Rural Mailed Survey..... 77
Foote, R. J. Book review: Econometrics, by J. Tinbergen..... 23
Fox, Karl.
Book review: Linear Computations, by Paul S. Dwyer..... 61
Book review: Statistical Methodology Reviews, 1941-50, edited by Oscar Krisen Buros..... 61
Some Relationships Between Agriculture and the General Economy. With Harry C. Norcross..... 13
Hansen, Peter L. The Economics of Input-Output Relationships in Feeding for Egg Production. With Ronald L. Mighell..... 1
Hendricks, Walter A. Book review: The Design and Analysis of Experiments, by Oscar Kempthorne..... 101
Kellogg, Charles E. Book review: Land for Tomorrow, by L. Dudley Stamp..... 135
Koffsky, Nathan M.
Book review: Conference on Business Cycles, by National Bureau of Economic Research..... 142
Book review: Economic Mobilization and Stabilization, by Lester V. Chandler and Donald H. Wallace..... 60
Book review: Index numbers, by Bruce D. Mudgett..... 28
Book review: What Happens During Business Cycles, by Wesley C. Mitchell..... 143
Lowenstein, Frank. Factors Affecting the Domestic Mill Consumption of Cotton..... 44
Mighell, Ronald L. The Economics of Input-Output Relationships in Feeding for Egg Production. With Peter L. Hansen..... 1
Norcross, Harry C. Some Relationships Between Agriculture and the General Economy. With Karl A. Fox..... 13
Paarlberg, Don. Outlook Evaluation--Methods and Results. With John D. Baker, Jr..... 105

Page

Papanek, Gustav F. Book review: The Economics of Mobilization and Inflation, by Seymour E. Harris..... 59
Phillips, George R. Book review: Forests and Men, by William B. Greeley..... 27
Poli, Adon. Conducting A Survey of Ownership of Forest Land in California..... 8
Randall, C. Kyle. Book review: Subsidies for Farmers, compiled by Robert E. Summers..... 29
Rickenbacker, Joseph E. Book review: The Transportation Economics of the Soybean Processing Industry, by Earl C. Hedlund. 63
Robbins, George L. Book review: The American Cigarette Industry. A Study in Economic Analysis and Public Policy, by Richard B. Tennant..... 25
Rogers, Charles E. Book review: The Policy Sciences; Recent Developments in Scope and Method, Edited by Daniel Lerner and Harold D. Lasswell..... 99
Sartorius, Lester C. Eating Places as Food Marketers--Methods, Problems and Areas for Further Research..... 88
Smith, Cecil C. Effect of Personal Visits on Response Rates to Mail Surveys..... 126
Taeuber, Conrad.
Book review: Four Thousand Million Mouths, Edited by F. Le Gros Clark and N. W. Pirie..... 98
Book review: The Geography of Hunger, by Josue de Castro..... 98
Taylor, Carl C. Book review: Economic Resources and Policies of the South, by Calvin B. Hoover and B. U. Ratchford..... 26
Todd, A. S., Jr. A Test of Survey Methods for Estimating Stumpage Prices. With John J. Zirkle, Jr..... 115
Wasserman, Max J.
Book review: The Foundations of Economics, History and Theory in the Analysis of Economic Reality, by Walter Eucken..... 30
Book review: Monopoly and Free Enterprise, by George W. Stocking and Myron W. Watkins..... 57
Waugh, Frederick V. Book review: Econometrics, by Gerhard Tintner..... 100
Wolfrey, William T., Jr. Book review: Scientific Research: Its Administration and Organization, edited by George P. Bush and Lowell H. Hattery..... 24
Zirkle, John J., Jr. A Test of Survey Methods for Estimating Stumpage Prices. With A. S. Todd, Jr..... 115

- - 0 - -